UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

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Title: **PROPOSED PLAN FOR REMEDIAL ACTION
American Chemical Services Superfund Site
Griffith, Indiana, June 1992**

INTRODUCTION

This fact sheet describes the U.S. Environmental Protection Agency's (EPA's) recommended remedial alternative and the other options considered for controlling contamination at the American Chemical Services Superfund site located in Griffith, Indiana. Included are summaries of the background and history of the site, investigation activities and results to date, and a summary of the recently completed Feasibility Study (FS).

This proposed plan is based upon information available in the Remedial Investigation (RI) report and the FS as well as other documents found in the Administrative Record file for the site.

Section 117 (a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires that the public be notified of the remedial alternatives being considered for site contamination and the remedy recommended by EPA and the Indiana Department of Environmental Management (IDEM). This fact sheet, along with the public meeting to be held July 9, 1992, relays the key elements of the FS and EPA's preferred alternative. The public is encouraged to review documents available in the Administrative Record and to submit comments on all the alternatives presented in the proposed plan for the ACS site. Comments made by the public will be addressed in a document called a Responsiveness Summary and evaluated when selecting the alternative remedy for the site. EPA and IDEM will select a final remedy for the site only after the public has had an opportunity to comment on the proposed plan and the comments have been reviewed and considered. **The Responsiveness Summary will be attached to the Record of Decision, EPA's document describing the chosen alternative.**

SITE BACKGROUND

The American Chemical Services Superfund site (ACS), located at 420 S. Colfax Ave., Griffith, (Fig. 1) includes ACS property (19 acres), Pazmey Corp. property (formerly Kapica Drum, Inc, now owned by Darija Djurovic.; two acres) and the inactive portion of the Griffith Municipal Landfill (approximately 15 acres) (Fig. 2). The ACS Superfund Site includes all these properties. ACS began as a solvent recovery facility in May 1955, exclusively reclaiming solvents until the late 1960s. Reclaimed during this period were solvent mixtures containing volatile organic compounds (VOCs), alcohols, ketones, and other **organic compounds** which contained various residues. Kapica Drum, Inc., began operations reconditioning 55-gallon drums in 1951 and began picking up drums from ACS in 1955.

In the late 1960s and early 1970s, small batches of chemicals were manufactured at ACS. Specific chemicals manufactured included barium naphtherate, brominated vegetable oil, lacquers and paints, liquid soldering fluid, and polyethylene solutions in polybutene. These early manufacturing operations also included bromination, treating rope with a fungicide, and treating ski cable.

Two on-site incinerators burned still bottoms, non-reclaimable materials generated from the site, and off-site wastes. The first incinerator started operating in 1966, the second in 1969, and burned about two million gallons of industrial waste per year. The incinerators were dismantled in the 1970's. The shells were cut up and scrapped; the burners and blowers remain on-site.

Batch manufacturing was expanded between 1970 and 1975. Additives, lubricants, detergents and soldering flux were manufactured, and an epoxidation plant created a product called a plasticizer. Since 1975, the small batch manufacturing and epoxidation plant operations have remained essentially the same.

Kapica Drum, Inc., was sold to Pazmey Corp. in February 1980, which sold it to Darija Djurovic in March 1987. Kapica/Pazmey has not operated at this location since 1987. In 1980, a 31-acre parcel of property to the west of the Off-site Containment Area was sold to the City of Griffith for an expansion of the City's municipal landfill. The Griffith Municipal Landfill has been an active sanitary solid waste disposal facility since the 1950s. Solvent recovery operations at ACS continued until 1990 when ACS lost interim status under the **Resource Conservation and Recovery Act (RCRA)** regulations due to an EPA enforcement action. Semi-volatile organic compounds (SVOCs) such as phenol, isophorone, napthalene, fluorene, phenanthrene, anthracene, bis (2-chloroethyl) ether, and phthalates were used and discarded at the site throughout its history.

A fact sheet, dated September 1990 and available in the information repositories, summarizes RCRA activities at the site.

Several areas on the ACS property were used for disposal of hazardous substances. The disposal areas on the ACS Site, depicted in Figure 2, have been consolidated into three identified source areas: 1) the On-Site Containment Area; 2) the Still Bottoms Area, Treatment Lagoon #1 and adjacent areas; and 3) the Off-Site Containment Area and Kapica/Pazmey property. The Off-Site Containment Area is located on the ACS property and is part of the ACS Site. The area is described as off-site since it is separated from the ACS plant by a fence and railroad tracks. The Off-site Area includes the Off-site Containment Area and the Kapica/Pazmey property. The On-site Area includes the On-site Containment Area, the Still Bottoms Area, Treatment Lagoon #1, and adjacent areas (oily soil area designated in Fig. 2).

ACS was placed on the National Priorities List (NPL), a roster of the nation's worst hazardous waste sites targeted for cleanup under Superfund authority, in September 1984. Approximately 400 drums containing sludge and semi-solids of unknown types were reportedly disposed of in the On-site Containment Area. The Off-site Containment Area was utilized principally as a waste disposal area and received wastes that included on-site incinerator ash, general refuse, a tank truck containing solidified paint, and an estimated 20,000 to 30,000 drums that were reportedly punctured prior to disposal. Hazardous substances were also disposed, directly, and as a result of drum washing operations, on the Kapica/Pazmey property. The Still Bottoms Pond and Treatment Lagoon #1 received still bottoms from the solvent recovery process. The pond and lagoon were taken out of service in 1972, drained, and filled with drums containing sludge materials. A Consent Order to perform a remedial investigation/feasibility study was signed by the PRP's in June 1988. The remedial investigation began in 1989.

REMEDIAL INVESTIGATION RESULTS

Data for the RI report were collected during three phases and a Supplemental Technical Investigation (STI). The general purpose of Phase I was to identify each **zone of contamination** so that a more focused investigation could be implemented. Phase I consisted of doing aerial photograph reviews, taking site boundary surveys, geophysical surveying, monitoring well installation and sampling, piezometer installation to characterize ground-water flow, leachate -well installation and sampling in the Griffith Municipal Landfill, collection of surface water samples, effluent sampling, surface soil sampling, sampling soil borings, sediment sampling, auger probes, aquifer testing, and test pit excavations. Phase II, the STI and Phase III consisted of private well sampling, documenting the horizontal and vertical extent of contamination, and identifying the varieties of chemicals in each zone, generally expanding the investigation, based on Phase I results.

Phase I Results

Phase I of the RI was completed in December 1989. Phase I indicated that there were large areas of buried contamination with a wide range of contaminants. The major categories of wastes include: organic contaminants without **polychlorinated biphenyls (PCB's)** (approximately 90% of total buried contamination), organic contaminants with PCB's (approximately 7%), and various **heavy metals** (approximately 3%). These were found in the three identified **source** areas. The source areas are the on-site containment area, the still bottoms/treatment lagoon and adjacent areas, and the off-site containment and Kapica/Pazmey area (See Fig. 2.). Buried waste volumes for source areas were based on information collected during the RI. For the purpose of developing FS alternatives cost estimates, buried wastes were defined as areas of contamination with total VOCs in excess of 10,000 ppm (Fig. 3). PCB-contaminated soils in excess of 50 ppm were also delineated. Contaminated soils were defined as areas of contamination with total VOCs in excess of 10 ppm (Fig. 4). Soils contaminated with heavy metals (lead greater than 500 ppm was used as an indicator parameter) were also found associated with buried waste areas. Other isolated pockets of metallic contamination (lead greater than 500 ppm) were identified in the RI but not specifically addressed in the FS.

More and detailed results of Phase I of the RI can be found in Section 5 of the RI Report.

Phases II, III and STI Results

The on-site containment source-area contaminants consist predominately of organic contaminants without PCB's (15,000 cubic yards). Additional contaminants consist of a 50'x 50' buried drum area (estimated to contain 400 intact drums), and localized areas of organic contaminants with PCB's (980 cubic yards) and soils contaminated with metals (100 cubic yards).

The still bottoms/treatment lagoon and adjacent source-area contaminants consist predominantly of organic contaminants without PCB's (22,000 cubic yards) and randomly distributed buried drums (estimated to contain 3200 partially filled drums). Organic contaminants with PCB's were not detected in the treatment lagoon area, but were detected in the still bottoms area (1000 cubic yards). Metals were detected in both areas (550 cubic yards). In an adjacent area, west of the existing fire pond, (designated as "oily soils" in Fig. 2) both organic contaminants without PCB's (3400 cubic yards) and organic contaminants with PCB's (300 cubic yards) were detected.

The off-site containment source-area contaminants consist predominantly of organic contaminants without PCB's (51,000 cubic yards). However, organic contaminants with PCB's (5250 cubic yards) and metals (950 cubic yards) were detected primarily in one area in the northern portion, as well as at a number of small areas in the southern portion. General refuse, an estimated 20,000 to 30,000 drums, and a tank truck partially full of solidified paint were reportedly disposed of in this area. The Kapica/Pazmey source area contaminants consist of organic contaminants without PCB's (7200 cubic yards) and organic contaminants with PCB's (2300 cubic yards) in an area north of the Kapica building. Metal contamination is found in the west (700 cubic yards) and north (200 cubic yards) of the Kapica building.

Organic contaminants without PCB's, including chlorinated ethanes, partially water soluble products from gasoline, oil and/or other **hydrocarbon** products (e.g. benzene, toluene, xylene) were found in the upper **aquifer**. Lower aquifer contamination relative to the upper aquifer is limited, both with respect to the nature of compounds detected and the extent. Contaminants do not extend off-site to lower aquifer wells. No organic contaminants were detected at any lower aquifer private residential well (see Figs 5-9). Upper aquifer privat residential wells were not sampled during the RI.

A discussion of the nature and extent of contamination can be found in Section 5 of the RI Report. A detailed list of contaminants and concentrations can be found in Appendix R of the RI Report.

SUMMARY OF SITE RISKS

A major component of the RI was to assess potential risks to public health and the environment if the ACS site is not cleaned-up. This component is called a baseline risk assessment (BlRA). Using information about what contaminants are present at the site, as well as the concentrations, amounts, locations and ability of contaminants to travel off-site, a BlRA was developed to determine what, if any, risks are posed by the site and if remedial action was warranted. Forty-four chemicals were chosen as being representative of the contamination at ACS.

The BlRA indicates that current site risks (primarily through airborne contaminants) are unacceptable (a summary of hazard indices and cancer risks for potentially exposed population is presented in Table 7-38 of the BlRA {attached}). Unacceptable cancer risks are risks that may result in 1 additional cancer in 10,000 to 1,000,000 people exposed over a 70-year lifetime (expressed in scientific notation as 1 X 10-4 to 1 X 10-6). This is in addition to what is normally expected in a given population (currently 1 in 3 for U.S. citizens in general). When the BlRA indicates that site risk to an individual exceeds the 1 X 10-4 excess cancer risk end of the risk range, remedial action is warranted at the site. Unacceptable non-cancer risks are identified by calculating a hazard quotient. For a given exposure pathway, the hazard quotients for all chemicals of potential concern are added to arrive at a total; the hazard index. If the hazard index or the hazard quotient exceed unity (1), there may be a potential health risk associated with exposure via the particular pathway (or chemical) evaluated.

Most of the site contamination is underground in the form of buried waste or contaminated ground water. There are no current ground water users that have been impacted by the site. Based on the ground water flow paths for the upper aquifer there is little potential for contaminated ground water to reach upper aquifer wells. Flow in the upper aquifer either discharges within site boundaries (the western wetlands) or does not come in contact with contaminant source areas. Lower aquifer ground water contaminants have not migrated off-site. If it is determined that a lower aquifer plume reaches the downgradient site boundary, local lower aquifer ground water users could be affected within an estimated 20 years of detection of off-site migration (assuming no cleanup action is taken).

VOC movement through soil and into the air from buried waste and contaminated soil was estimated by a computer model. This model is extremely conservative and represents a maximum release from all the source areas combined. Direct measurement of the quantity of VOCs released in the air from subsurface contamination was impossible to accomplish because of the presence of VOCs emanating from the operating ACS facility.

While EPA's estimates of risk are very conservative (they assume prolonged, regular, and massive exposure to contaminants), the risk levels at ACS are not acceptable to EPA.

The BlRA also evaluated potential health risks if the contamination was not addressed and if the site was developed for residential use. This future use scenario showed that future on-site residents could be exposed to an increased cancer risk, as well as other adverse noncancer health effects. Readers should understand this scenario is used only to measure risk. The unremediated site would not be developed for human use because of the levels of contamination found there.

Detailed results and interpretations are presented in the Baseline Risk Assessment, Volumes 1, 2, and 3, September 1991, found in the RI Report, Section 7.

ECOLOGICAL RISKS

An ecological assessment to evaluate negative effects on plants and animals was performed for the area surrounding the ACS site. Based on this assessment upland (terrestrial), wetland, and aquatic receptors may be negatively affected by contaminants present in environmental media (such as soils, sediments, and surface water) within the ACS vicinity. As with the baseline risk assessment, conservative assumptions were used throughout this ecological assessment.

Detailed results and interpretations are presented in the Ecological Assessment of the RI Report, September 1991, Section 7.2.

FEASIBILITY STUDY

Scope and Role of the Remedial Action

The purpose of the remedial action is to cleanup all buried waste source areas, contaminated soils, and groundwater. This action will protect residents from health risks related to contact with contaminated ground water, soil, or possible air emissions from buried wastes.

Remedial Action Goals

EPA has identified the goals to be accomplished at ACS. The overall goals are to adequately protect human health and the environment, and to reduce the release of contaminants into the environment. <u>**These goals can be found in the Feasibility Study, pages 2-1 through 2-3.**</u> In summary, they are:

* To ensure that public health and the environment are not exposed to cancer and non-cancer risks greater than the acceptable risk range from drinking water, soils, buried drums/liquid wastes/sludges, or other substances from the ACS site;
* to restore ground water to applicable state and federal standards;
* to reduce the migration of contaminants off site through water, soils or other media;
* to reduce the potential for erosion and possible migration of contaminants via site surface water and sediments, including areas surrounding Turkey Creek.

REMEDIAL ACTION ALTERNATIVES

In order to accomplish these goals, EPA examined eight remedial alternatives. There are nine specific criteria (see "EPA's Nine Evaluation Criteria" attached to this plan) that the EPA must use to analyze all of the alternatives. Based on the analysis of each alternative against these criteria, EPA recommends the one that represents the best balance between the criteria and the remedial objectives. The following is a brief explanation of the alternatives considered.

A final note of explanation is necessary to avoid confusion regarding the terminology of site features. Using Figure 2 as a guide, the On-site Area refers to the fenced area north of the east-west railroad bisecting the site. The On-site Area therefore contains the On-site Containment Area, the 400 intact buried drums, the Still Bottoms Pond, the Treatment Lagoon #1, and adjacent contaminated soils ("oily soils"). Wetlands identified to receive controlled discharge are directly west of the On-site Area. The Off-site Area refers to the area south of the bisecting railroad and east of the Griffith Municipal landfill. The Off-site Area contains the Off-site Containment Area and the Kapica/Pazmey Area. References made to sending material "off-site" actually mean physically transporting material off-site of the ACS Superfund Site. Likewise, treating "on-site" means physically on the ACS Superfund site and has nothing to do with the above identified site areas.

Common elements of all alternatives, except the No Action Alternative 1 include; continued monitoring and eventual closure of the Griffith Municipal Landfill, a ground-water pumping and treatment system optimized for aggressive remediation, controlled treated groundwater discharge to wetlands and or groundwater reinjection, 30-year groundwater monitoring period, deed restrictions, fencing, and possible well closures to reduce the potential for human exposure.

Alternative 1: No Action

CERCLA requires that a "No Action" alternative be considered, against which all other alternatives are compared. Under this alternative, no rememdial action would take place and the site would remain in its present condition. All contamination would remain in the source areas, ground water and soils, with continued potential for entering water supplies. The Griffith Municipal Landfill would continue to operate and would eventually close under State law. Every five years a review would be performed to evaluate the site's threat to public health and the environment.

Total cost of Alternative 1: $ 0
Time to complete: 0
Quantity of waste treated: 0
Quantity of soil treated: 0

Alternative 2: Containment with slurry wall; on-site ground-water gradient control; ground-water pumping and treatment outside slurry wall; and covering contaminated surface soils.

Alternative 2 provides for the construction of a slurry wall around the entire site to minimize off-site contaminant migration and impede groundwater flow into the site. The soil/bentonite slurry wall would be keyed into a clay confining layer (approximately 25 feet below the surface). Inward groundwater gradients would be maintained by pumping from within the slurry wall.

Groundwater pumping and treatment would be performed outside the slurry wall to prevent off-site migration. Treated groundwater would be discharged or reinjected to the wetlands to prevent dewatering. Contaminant source areas would be covered with a RCRA cap. Operational areas of the ACS facility could be covered with asphalt or concrete.

Total cost of Alternative 2: $ 12,000,000
Total time to complete construction: 1 year
Operation and maintenance period: 30 years
Quantity of waste treated: 0
Quantity of contaminated soil treated: 0

<u>Major ARARs</u>
SDWA- MCLs for groundwater
CWA- Discharge standards, pretreatment POTW standards
RCRA- hazardous waste handling, storage & treatment, closure/post-closure, cap, corrective action

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Alternative 3: Dewatering of On-site areas; Excavation and (a) on-site incineration of buried waste or (b) on-site low temperature thermal treatment of buried waste.

Alternative 3 provides for site dewatering using a series of groundwater pumping wells to allow excavation of buried waste. Excavated waste would be treated on-site by incineration (3a) or with a low temperature thermal treatment unit (3b). Treatment residuals would be placed back into the excavation. An infiltration basin would be constructed over each source area in order to use treated groundwater to flush contaminants.

Total cost of Alternative 3a: $ 54,800,000
Total cost of Alternative 3b: $ 45,100,000
Total time to complete source treatment: 3 years

Quantity of waste treated: 35,000 - 65,000 cubic yards
Quantity of contaminated soil treated: 0

Major ARARs
SDWA- MCLs for groundwater
TSCA- PCB handling
CWA- Discharge standards, pretreatment POTW standards
CAA- Air Emissions, IDEM BACT
RCRA- hazardous waste handling, storage & treatment, closure/post-closure, cap, corrective action, incineration standards, LDRs/treatability variance levels.

Alternative 4: In-situ steam stripping of buried waste, soils, and ground water.

Alternative 4 would simultaneously treat buried wastes, soil and on-site groundwater in place. In-situ steam stripping consists of injecting steam at approximately 400 degrees farenheit through specially designed hollow stem augers which are moved vertically through the unsaturated and saturated zones. PCB-contaminated surficial soils would either be treated in-situ or excavated for off-site landfilling.

Cost of Alternative 4: $ 50,900,000
Total time to complete treatment: 10-20 years
Quantity of waste and soil treated: 135,000 cubic yards

Major ARARs
SDWA- MCLs for groundwater
TSCA- PCB handling
CWA- Discharge standards, pretreatment POTW standards
CAA- Air Emissions, IDEM BACT
RCRA- hazardous waste handling, corrective action, closure/post-closure.

Alternative 5: Offsite incineration of intact buried drums in the On-site Containment Area; Off-site disposal of miscellaneous debris; In-situ vapor extraction of buried waste and soils.

Alternative 5 provides for site dewatering using a series of groundwater pumping wells to allow for excavation of intact drums and miscellaneous debris. Intact buried drums in the On-site Containment Area would be incinerated off-site while miscellaneous debris would be landfilled off-site. PCB-contaminated surficial soils would either be treated in-situ or excavated for off-site landfilling. An in-situ vapor extraction (ISVE) system (possibly four separate systems) would then be installed to treat both soils and buried wastes. A cover would be placed over unpaved surfaces in the areas that require ISVE to prevent short-circuiting of air from the surface and to reduce rainwater infiltration. A pilot scale test would need to be conducted to demonstrate the overall effectiveness of ISVE on materials with such high contaminant levels.

Cost of Alternative 5: $33,000,000
Total time to complete treatment: 5 - 20 years
Quantity of waste and soil treated: 135,000 cubic yards

<u>Major ARARs</u>
SDWA- MCLs for groundwater
TSCA- PCB handling
CWA- Discharge standards, pretreatment POTW standards
CAA- Air Emissions, IDEM BACT
RCRA- hazardous waste handling, corrective action, closure/post-closure.

Alternative 6: (a) on-site or (b) off-site Incineration of buried drums; offsite disposal of miscellaneous debris; (a) on-site incineration of waste or (b) on-site low temperature thermal treatment of waste; in-situ vapor extraction of soils.

Alternative 6 provides for site dewatering using a series of groundwater pumping wells to allow for excavation of intact drums and miscellaneous debris. Intact drums would be incinerated on-site (6a) or off-site (6b) while miscellaneous debris would be landfilled off-site. Areas designated as buried waste or PCB-contaminated soils would either be incinerated on-site (6a) or treated with low temperature thermal treatment (6b). Treatment residuals would be deposited back into the excavations. An in-situ vapor extraction (ISVE) system (possibly four separate systems) would then be installed to treat contaminated soils. Partial installation of a ISVE system could begin following the completion of site dewatering in areas which are not impacted by buried waste excavation activities. A cover would be placed over unpaved surfaces in the areas that require ISVE to prevent short-circuiting of air from the surface and to reduce rainwater infiltration. A pilot scale test would need to be conducted to demonstrate the overall effectiveness of ISVE on materials with such high contaminant levels.

Cost of Alternative 6a: $ 43,100,000 - $ 56,600,000
Cost of Alternative 6b: $ 37,800,000 - $ 46,800,000
Time to complete treatment: 6 - 8 years
Quantity of waste treated: 35,000 - 65,000 cubic yards
Quantity of soil treated: 70,000 - 100,000 cubic yards

Major ARARs
SDWA- MCLs for groundwater
TSCA- PCB handling

CWA- Discharge standards, pretreatment POTW standards
CAA- Air Emissions, IDEM BACT
RCRA- hazardous waste handling, storage & treatment, closure/post-closure, cap, corrective action, incineration standards, LDRs/treatability variance levels.

Alternative 7: (a) on-site or (b) off-site Incineration of buried drums; off-site disposal of miscellaneous debris; (a) onsite incineration of buried wastes and soils or (b) onsite low temperature thermal treatment of buried wastes and soils.

Alternative 7 provides for site dewatering using a series of groundwater pumping wells to allow for excavation of intact drums and miscellaneous debris. Intact drums will either be incinerated on-site (7a) or off-site (7b). Miscellaneous debris will be taken off-site for landfilling. Buried waste and contaminated soils will be incinerated on-site (7a) or treated on-site through low temperature thermal treatment (7b). Treatment residuals would be deposited back into the excavations.

Cost of Alternative 7a: $84,600,000
Cost of Alternative 7b: $64,400,000
Time to complete treatment: 2 - 6 years
Quantity of waste and soils treated: 135,000 cubic yards

<u>Major ARARs</u>
SDWA- MCLs for groundwater
TSCA- PCB handling
CWA- Discharge standards, pretreatment POTW standards
CAA- Air Emissions, IDEM BACT
RCRA- hazardous waste handling, storage & treatment, closure/post-closure, cap, corrective action, incineration standards, LDRs/treatability variance levels.

Alternative 8: Off-site incineration of buried drums; off-site disposal of miscellaneous debris; (a) landfarming of buried waste and soils or (b) slurry-phase bioreactor treatment of buried waste and soils.

Alternative 8 provides for site dewatering using a series of groundwater pumping wells to allow for excavation of buried wastes, contaminated soils, intact drums and miscellaneous debris. Intact drums will be incinerated off-site. Miscellaneous debris will be taken off-site for landfilling. Buried waste and contaminated soils will be treated on-site through biological treatment. Biological treatment would be accomplished by land-farming (8a) or by slurry-phase bioreactors (8b). Treated soils would be deposited back into excavations. Because it is not known if biological treatment would attain appropriate treatment levels, a pilot study would be necessary to evaluate the technology on this contaminant matrix.

Cost of Alternative 8a: $ 34,200,000
Cost of Alternative 8b: $ 43,200,000
Time to Complete treatment: 8 - 15 years (8a)
5 years (8b)
Quantity of waste and soils treated: 135,000 cubic yards

Major ARARs
SDWA- MCLs for groundwater
CWA- Discharge standards, pretreatment POTW standards
CAA- Air Emissions, IDEM BACT
RCRA- hazardous waste handling, storage & treatment, closure/post-closure, cap, corrective action, LDRs/treatability variance levels.

Section 3.7 of the FS report addresses remedial alternatives available for the known sources of contamination. Section 4 provides a detailed analysis of the remedial action alternatives.

EPA'S RECOMMENDED REMEDY

Of 8 alternatives considered for the ACS site, EPA recommends Alternative 6b as the preferred remedy.

ALTERNATIVE 6B PREFERRED REMEDY:

SITE WIDE: off-site incineration of intact buried drums; off-site disposal of miscellaneous debris; in-situ vapor extraction pilot study for contaminated soils.

ON-SITE AREA: in-situ vapor extraction of contaminated soils; in-situ vapor extraction pilot project for selected buried wastes.

OFF-SITE AREA: in-situ vapor extraction of contaminated soils; on-site low temperature thermal treatment of buried wastes (with vapor emission control during excavation and possible immobilization after treatment); treatment residuals would be required to meet health-based levels prior to redepositing back into excavations;

GROUND WATER: ground water pumping and treatment; treated water controlled discharge to wetlands; continued evaluation and monitoring of wetlands. Continued monitoring of the Griffith Municipal Landfill and eventual closure under State law.

In this remedy, Alternative 6b requires site dewatering through a ground water pump and treat system. The method of ground water treatment will be determined in design. A portion of the treated ground water will be discharged to the western wetlands (in a controlled fashion to prevent wetland degredation) to prevent dewatering. The following discharge options exist for the remaining quantity of treated ground water: discharge to the Hammond POTW; discharge to the drainage ditch running through the western wetlands; discharge directly to Turkey Creek or a tributary; and reinjection. Reinjection of treated ground water after buried waste excavation and ISVE are complete is considered because nutrient addition to treated ground water could promote bioremediation of any residual SVOC contaminants remaining in the subsurface. Continued wetland evaluation has been recommended in the USEPA-produced ecological assessment and will be implemented as part of this remedy.

When site dewatering activites are complete (approximately 120 days) excavation of intact buried drums for off-site incineration will be implemented. Excavation and low temperature thermal treatment (LTTT) of buried wastes in the Off-site Area, PCB-contaminated soils greater than 10 ppm in both the On-site and Off-site Area, and isolated VOC-contaminated soil not within the areas to be addressed by In-situ Soil Vapor Extraction (ISVE) will also commence after dewatering (following treatability studies to determine this technology's effectiveness on contaminant matrix). Isolated pockets of heavy metal-contaminated soils >500ppm lead will also be excavated, treated by LTTT to remove VOCs and SVOCs and immobilized to meet characteristic treatment standards for metals. Vapor emissions will be contained during excavation and ambient air monitoring will be required. All LTTT residuals will be deposited back into the excavations after meeting appropriate health-based levels.

USEPA has determined that LDR treatability variance standards are not protective for redeposited soils. PCB contamination less than 10 ppm and greater than established cleanup standards will require a 10 inch soil cover.

Both On-site Area and Off-site Area Soils contaminated with VOCs and SVOCs will be treated with ISVE. If it is determined by USEPA that final remediation goals cannot be met then VOC/SVOC contaminated soil will be excavated, treated by LTTT to health-based standards, and redeposited.

Because it is not proven that ISVE technology will work on buried wastes with such high contaminant levels and because buried drums may interfere with the ISVE effectiveness, a pilot study will be conducted on a portion of the buried wastes in the On-site Area. The On-site Area was chosen because it was determined through the RI that buried drums were more accurately defined than in the Off-site Area. This pilot study will be conducted in conjunction with the ISVE system to be developed for all contaminated site soils and will have a defined proof of performance period. At the end of the performance period, it will be determined by USEPA if in-situ soil vapor extraction is effective on buried waste and contaminated soils. Confirmation sampling will be required to determine if ISVE can meet health-based levels. If the technology is capable of meeting remediation goals then it may be expanded to unremediated portions of the On-site Area. The potential benefit derived from successful demonstration of ISVE's effectiveness on On-site Area buried waste would be a decrease in the overall cost of remediation and a reduction of the amount of material that would have to be handled for LTTT. If the technology doesn't meet remediation goals then LTTT will be implemented for all buried wastes. Even if the pilot study fails to demonstrate that ISVE can meet remediation levels, the potential decrease in VOCs in the waste might negate the need for elaborate VOC emission control in the On-site Area during buried waste excavation and drum removal. Regardless of the pilot study results, LTTT will be implemented and completed for buried wastes in the Off-site Area. USEPA has determined that ISVE technology is not appropriate for the Off-site Containment Area due to the large number and random distribution of buried drums.

Miscellaneous debris uncovered during excavation activities will be steam-cleaned and sent off-site for disposal. Any intact buried drums excavated will be sent off-site for incineration. Wash waters will be treated in the ground water treatment system.

This alternative has been supplemented by USEPA because alternative 6b, as proposed in the FS, did not address VOC emissions resulting from excavation, heavy metal-contaminated soils outside of defined source areas, and continued evaluation of the wetlands.

Implementation of an unproven technology through pilot testing on a contaminant matrix and scale found at the ACS site may provide valuable data for remediation of future sites. Because LTTT will be implemented in the Off-site Area, no time will be lost in the overall remediation of this site. It should be noted that this recommended remedy is preliminary and could change as a result of public comments or new information.

A detailed examination of how Alternative 6b complies with EPA's nine evaluation criteria can be found in Section 5 of the FS. For a comparative analysis of the nine criteria for this and the other alternatives, see page 24 of this fact sheet.

Alternative 6b would cost $21.6 - 30.6 million to construct and $16.2 million to operate and maintain (over a 30 year period), reflecting a **Present Net Worth (PNW)** cost of $37.8 - 46.8 million. It would take from 6 to 8 years to complete this remedial alternative. Ground-water monitoring would continue after construction for 30 years.

If it is determined by EPA that the ISVE pilot project is ineffective for the Onsite Area then LTTT will replace ISVE for the On-site Area. Given this scenario, the total remediation time for the entire site would be in the 6 to 8 year range. If ISVE proves to be effective in treating buried waste in the On-site Area, then total remediation time for the entire site could be as long as 20 years.

COMPARATIVE ANALYSIS OF ALTERNATIVES ACCORDING TO THE NINE EVALUATION CRITERIA

The remedial action alternatives considered for the ACS site were evaluated in accordance with the nine evaluation criteria. An analysis summary of the alternatives compared to the criteria is provided below. **This can be found in Section 5 of the FS report. Capital, annual operation and maintenance, and net present worth costs are presented in Table 4-16 and Appendix B of the FS report.**

Overall Protection

Alternative 1 does not provide any protection against contaminant exposure through buried waste, soil or ground water contact or posssible exposure of emissions from buried wastes and would not prevent future site users from being exposed to unearthed soils or buried wastes resulting from future development of the site.

Buried waste materials are addressed in Alternatives 2 thru 8. Alternatives 3, 6, 7 and 8 provide the most protection from buried wastes because the wastes would be excavated and treated. Residual contamination would be left in the ground after treatment under Alternatives 2, 4 and 5. If buried wastes were disturbed under a future use scenario, the risks would be greater for Alternative 2, than Alternatives 4 and 5.

Contaminated soils are addressed in Alternatives 2 thru 8. Alternative 7 would provide the most protection from contaminated soils through thermal treatment. Alternative 8 treats contaminated soils biologically and affords a slightly lower degreee of protection due to the uncertainity of the technology to adequately handle ACS's contaminant matrix. Residual contaminants would remain in soils in Alternatives 2 thru 6. Alternatives 2 and 3 are the least protective, providing natural flushing as the only soil treatment.

Alternatives 4 thru 8 provide the most protection for contaminated ground water by applying pumping and treatment of the upper and lower aquifers. Alternatives 2 and 3 provide reduced protection through containment and natural flushing of on-site groundwater.

Compliance with ARARs

All alternatives should comply with ARARs, except Alternative 1 (no action). However, the RCRA cap, corrective action, and closure ARARs outlined in alternative 2 also apply to alternatives 3, 6, 7, and 8 if treatment residuals do not meet health-based levels. If treatment residuals only meet the less stringent LDR treatability variance levels, then a RCRA compliant cap would be required over redeposited treatment residuals. Alternatives that include excavation and treatment (3, 6, 7, and 8) will require treatability testing to ensure that all RCRA standards are met. Another criterion to be considered is the TSCA cleanup policy for PCB spills. This policy requires that spills resulting in PCB contamination of greater than 50 ppm be cleaned up to a level of 10 ppm and covered with at least 10 inches of clean soil. Major ARARs for each alternative are identified in the explanation of remedial alternatives.

Tables 3-2 through 3-4, of the FS provide a summary of ARARs for all alternative.

Implementability

Alternatives 1 and 2, requiring no action or containment only, would be easiest to implement. Alternatives 3, 6, and 7 involve proven technologies and have been effective for a wide range of contaminated matrices. Alternatives 5 and 8 have yet to be demonstrated effective on a contaminant matrix or scale analogous to the ACS site. Alternative 4 technology has not been demonstrated on full scale soil and waste cleanups and no known vendor is available.

Short-term Effectiveness

Alternative 1, the no action alternative, is not a remedy and would therefore provide no short-term effectiveness. Alternatives 2 thru 8 require ground water pumping and treatment and would be equally effective in addressing off-site short-term risk from ground water. Alternatives 2 and 3 would be less effective in addressing on-site ground water contamination. Alternatives which require excavation of wastes and soils (7 and 8) produce potential short-term exposure of contaminants to site workers and nearby residents. Alternatives which involve excavation of buried waste only and insitu treatment of contaminanted soils (3 and 6) would produce much shorter exposure to site workers and nearby residents and would also remove the majority of site contamination in a relatively short timeframe. Alternatives 4 and 5 attempt to treat buried wastes and contaminated soils insitu. This would involve a minimum of short-term exposure but unknown effectiveness and relatively long timeframes to complete.

Long-term Effectiveness

Alternative 1 provides no long-term effectiveness. Alternatives 2 thru 8 require ground water pumping and treatment and would be equally effective in truncating continued migration of contaminants in ground water and potential exposure to offsite ground water users. Alternatives 2 and 3 would be less effective in addressing on-site ground water contamination.

The buried waste at the site currently does pose an unacceptable risk to public health. There is more uncertainity with Alternative 2 than others in alleviating this risk because its effectiveness is dependent upon the cover material and the slurry wall performing adequately over the long-term.

Alternatives which require removal and treatment of wastes (3, 6, 7, and 8) will result in much lower residual contamination and fewer long term maintenance problems. The effectiveness in significantly removing contaminants from wastes thru Alternatives 4 and 5 is suspect. Residual contaminants in waste would definitely remain in the ground after treatment in Alternatives 2, 4, and 5.

Alternative 2 provides the same relative level of protection for contaminated soils as is discussed above for buried wastes. Alternative 3 provides only for natural flushing of contaminants from soils. Alternatives 4, 5, 6, 7, and 8 provide for treatment of contaminated soils. Alternatives 5 and 6 use the same technology and would therefore be equally effective. The relative effectiveness of Alternatives 4 and 8 is unknown. Alternative 7 would be the most effective in removing risk from contaminated soils.

Reduction of Toxicity, Mobility and Volume

Alternative 1 does nothing to reduce toxicity, mobility or volume through treatment. Both the toxicity, mobility and volume of off-site ground water contaminants would be equally reduced in Alternatives 2 thru 8. Alternatives 2 and 3 would be less effective than Alternatives 4 thru 8 in reducing on-site ground water contaminant toxicity.

Alternative 2 provides only for containment and flushing of buried waste so this alternative would not significantly reduce the toxicity or volume but is designed to reduce contaminant mobility. The toxicity and volume of contaminants in wastes are reduced in Alternatives 3 thru 8. The greatest probable reduction in volume and toxicity would occur with Alternatives 3, 6, and 7. The degree of volume and toxicity reduction in Alternatives 4, 5, and 8 would have to be determined with bench and pilot scale testing. It should be noted that none of the alternatives reduce the volume or toxicity of heavy metals in the waste.

Alternatives 2 and 3 provide only for flushing of contaminated soils and therefore would probably retain the highest residual soil contamination. The effectiveness of Alternative 4 thru 8 in reducing contaminant volume, toxcity and mobility on contaminated soils would have to be determined through bench and pilot scale testing. Alternatives 5 and 6 are identical in treatment technology for contaminated soils. Alternative 7 would probably afford the greatest effectiveness.

Cost

Alternatives are evaluated for the costs of capital (construction), operation and maintenance, and present-worth. Cost estimates are presented at the end of each alternative explanation in Chapter 4 of the FS, and summarized on Table 1. This fact sheet includes cost at the end of each Remedial Action Alternative explanation.

State Acceptance

The State of Indiana, through IDEM, concurs with EPA's recommendation of Alternative 6b as the proposed plan for the American Chemical Services Superfund site.

Community Acceptance

EPA is providing an opportunity for public comment, from June 30 to July 29, concerning the recommended alternative and the other alternatives considered in the FS. These comments will be collected, evaluated and fully considered in the final selection of a remedy. **EPA's response to comments will be presented in a document called a Responsiveness Summary, and will be available in the information repositories.**

IN SUMMARY

EPA prefers Alternative 6b because it provides the best balance of tradeoffs with respect to the nine criteria. EPA believes the preferred alternative will meet the requirements of CERCLA to be protective of human health and the environment, attain ARARs, be cost-effective, use permanent solutions and alternative treatment technologies to the maximum extent practicable and, satisfy the statutory preference for treatment as a principal element.

PUBLIC INVOLVEMENT

EPA invites the public to provide comments on alternative discussed as potential remedies for contamination of the American Chemical Services Superfund site. These comments will be addressed and evaluated in the selection process of the remedy. A summary of all comments and EPA's responses will be contained in the Responsiveness Summary, which will be available in the information repositories. The Record of Decision, a document outlining the final choice for a remedy, will include a summary of comments and responses made on the alternatives.

Comments may be presented orally or in writing at the public meeting. Or, comments may be mailed to Karen Martin, Community Relations Coordinator, at the address below. Mailed comments must be postmarked by July 29, 1992.

FOR MORE INFORMATION

A public information repository has been established at the Griffith Town Hall, 111 N. Broad St., and the Griffith Public Library, 940 N. Broad St. Technical and other documents are sent there, and the public is welcome to review them. The Administratve Record File, which contains the information upon which the selection of the remedy will be based, is also available at the Griffithe Public Library.

You may also contact the following EPA personnel:

Karen Martin (P-19J)
Community Relations Coordinator
(312)886-6128

Wayde Hartwick (HSRL-6J)
Remedial Project Manager
(312)886-7067

U.S. Environmental Protection Agency
77 W. Jackson
Chicago, IL 60604

Toll free (9-4:30 central time): (800)621-8431

GLOSSARY

Aquifer - a zone or layer of rock, soil, sand or other porous material, found below the ground surface, that is capable of holding and yielding usable quantities of water; often a main source of drinking water.

Hydrocarbon - an organic chemical compound made up primarily of hydrogen and carbon; usually an oil type product.

Inorganic compounds - chemical compounds that do not contain hydrogen, carbon and oxygen; metals are examples of inorganic compound.

Maximum Contaminant Levels (MCL) - Enforceable federal standards for the maximum permissible level of contaminants in drinking water.

Metal - heavy metal - a family of inorganic elements that include arsenic, lead, chromium, mercury, zinc, and others; heavy metals can be toxic at relatively low concentrations.

Organic compounds - Chemicals composed mainly of carbon, hydrogen and oxygen, and found in materials such as solvents, soils and pesticides; they may be toxic when ingested, inhaled, or through skin contact.

Polychlorinated biphenyl (PCB) - a family of organic compounds used since 1926 in electric transformers as insulators and coolants, in lubricants, carbonless copy paper, adhesives and caulking compounds. PCB's are extremely persistent in the environment because they do not break down into less harmful chemicals. They are stored in human and animal fatty tissues. Long-term exposure can cause liver damage and has been shown to cause cancer in laboratory animals.

Potentially responsible parties (PRP's) - those persons, companies or other legal entities that could be held liable for study and cleanup costs of a Superfund site; they include owners, operators, generators and haulers of hazardous waste.

Present Net Worth (PNW) - an economic term used to describe today's cost for a Superfund cleanup and reflect the discounted value of future costs. A present worth cost estimate includes construction and future operation and maintenance costs. U.S. EPA uses present net worth values when calculating the cost of alternatives for long-term projects.

Resource Conservation and Recovery Act (RCRA) - a federal law that established a regulatory system to track hazardous substances from the time of generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing and disposing of hazardous substances. RCRA is designed to prevent new, uncontrolled hazardous waste sites.

Soil vapor extraction - a technology designed to pull air containing hazardous substances through soil and into pipes that carry it to a treatment facility designed to remove the contaminants from the air, and discharge the treated air either into the environment or back into the soil.

Source - where a hazardous substance is released into the environment; for example a spill area, a factory, or a portion of a landfill where hazardous substances were dumped.

Zone of contamination - an area in which contamination is found, either in the ground, the water, a landfill, or other defined area.

MAILING LIST

If you did not receive this fact sheet in the mail, you are not on the mailing list for the American Chemical Services Superfund site. To add your name, or to make a correction, please fill out this form and mail it to Karen Martin at the address above.

NAME ____

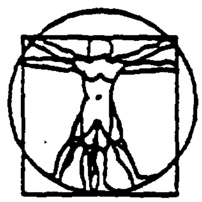
ADDRESS ____

PHONE NUMBER ____________________ AFFILIATION ____________________

EVALUATING THE CLEANUP ALTERNATIVES

U.S. EPA considers the following nine criteria when it evaluates cleanup alternatives like those developed in the FS. The first seven criteria have been used to evaluate the cleanup alternatives for this site. State acceptance has been considered during the development of the Proposed Plan; community acceptance will be evaluated after the public comment period.

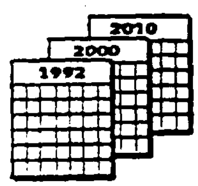
THRESHOLD CRITERIA



- **Overall protection of human health and the environment** addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with applicable or relevant and appropriate requirements (ARARs)** addresses whether a remedy will meet all of the ARARs of other Federal and State environmental laws and/or justifies a waiver.

BALANCING CRITERIA



- **Long-term effectiveness and permanence** refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

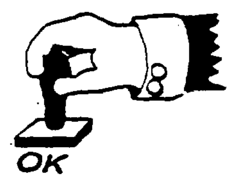
- **Reduction of toxicity, mobility, and volume through treatment** is the anticipated performance of the treatment technologies a remedy may employ.

- **Short-term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

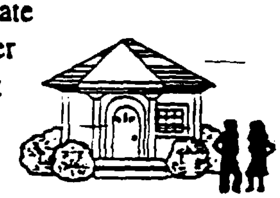
- **Implementability** is the technical and administrative feasibility ~~of~~ a remedy, including the availability of materials and services needed to implement a particular option.

- **Cost** includes estimated **capital** and **operation and maintenance** (O&M) costs, also expressed as **present net worth (PNW)** costs.

MODIFYING CRITERIA

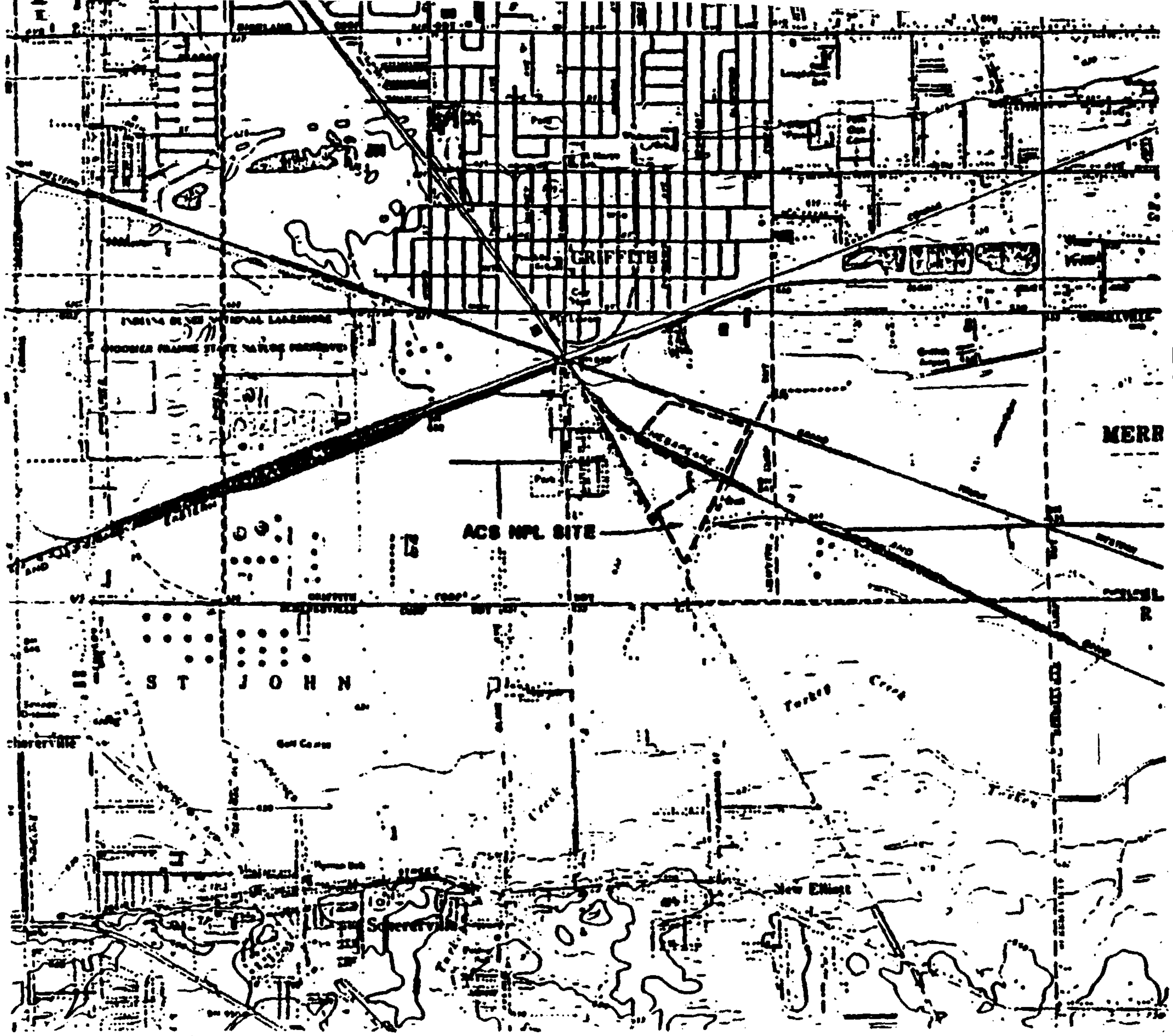


- **State acceptance** reflects aspects of the recommended alternative and other alternatives that the support agency favors or objects to, and any specific comments regarding State ARARs or the proposed use of waivers. The Proposed Plan should address views known at the time the plan is issued but should not speculate. The assessment of State concerns may not be complete until after the public comment period on the FS and Proposed Plan is held.



- **Community acceptance** summarizes the public's general response to the alternatives described in the Proposed Plan and in the FS, based on public comments received. Like State acceptance, evaluations under this criterion usually will not be completed until after the public comment period is held.

Of these nine criteria, the final cleanup action must meet the threshold criteria of protecting human health and the environment and complying with ARARs. If a proposed remedy meets these two criteria, it is evaluated against first the balancing criteria and then the modifying criteria in order to arrive at a final recommended alternative.

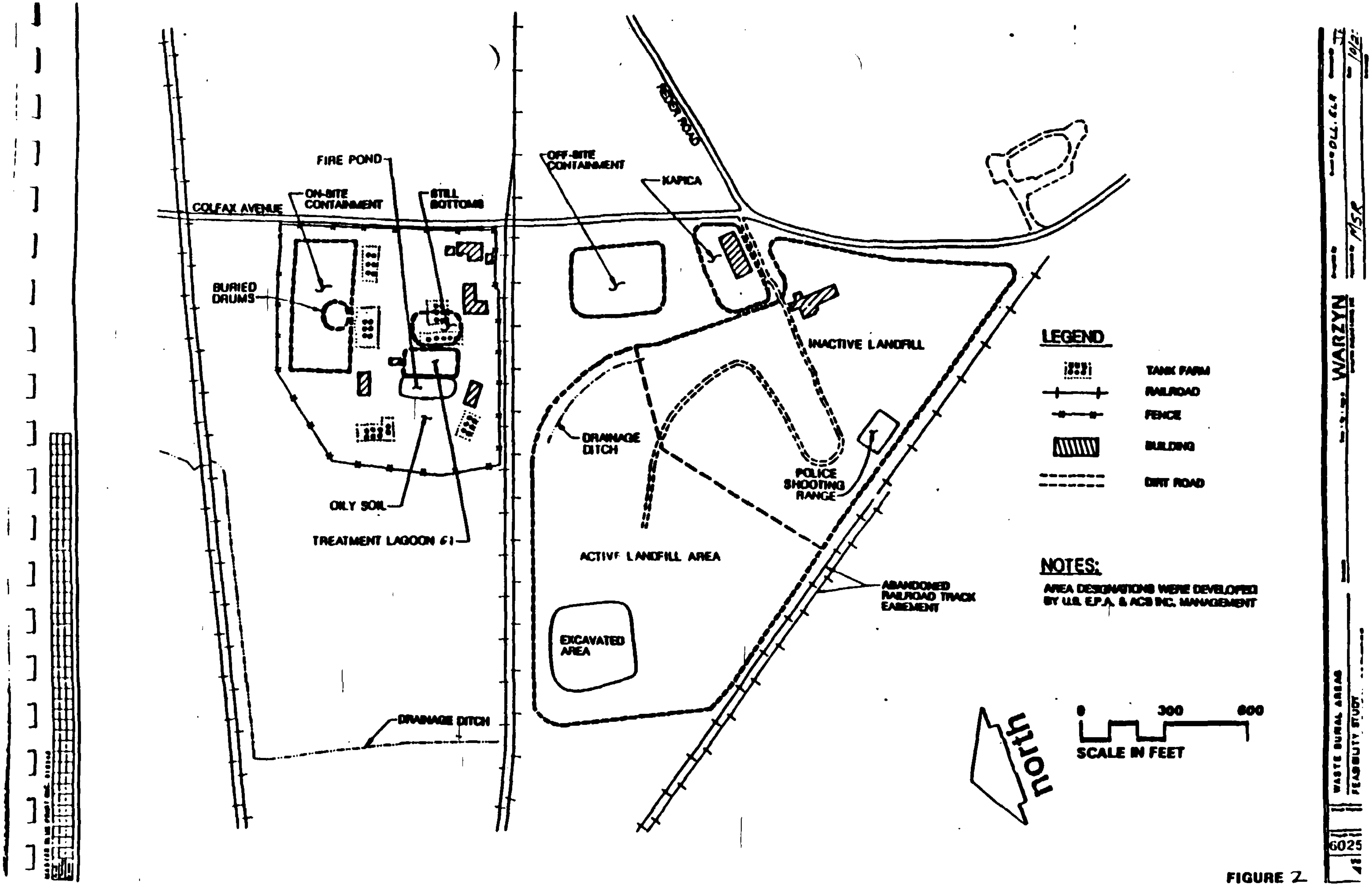


NOTES
1. BASE MAP DEVELOPED FROM HIGHLAND & ST. JOHN, INDIANA 7.5 MINUTE USGS TOPOGRAPHIC QUADRANGLE MAPS DATED 1966 AND 1962, RESPECTIVELY, PHOTOREVISED 1980.

FIGURE 1

SITE LOCATION MAP

WARZYN



FIRE POND
ON-SITE CONTAINMENT
STILL BOTTOMS
COLFAX AVENUE
BURIED DRUMS
OILY SOIL
TREATMENT LAGOON
DRAINAGE DITCH
OFF-SITE CONTAINMENT
KAPICA
INACTIVE LANDFILL
DRAINAGE DITCH
POLICE SHOOTING RANGE
ACTIVE LANDFILL AREA
EXCAVATED AREA
ABANDONED RAILROAD TRACK EASEMENT
LEGEND
TANK FARM
RAILROAD
FENCE
BUILDING
DIRT ROAD
NOTES:
AREA DESIGNATIONS WERE DEVELOPED BY U.S. E.P.A. & ACS INC. MANAGEMENT
0
300
600
SCALE IN FEET
north
WARZYN
WASTE BURIAL AREAS
FEASIBILITY STUDY
6025

FIGURE 2

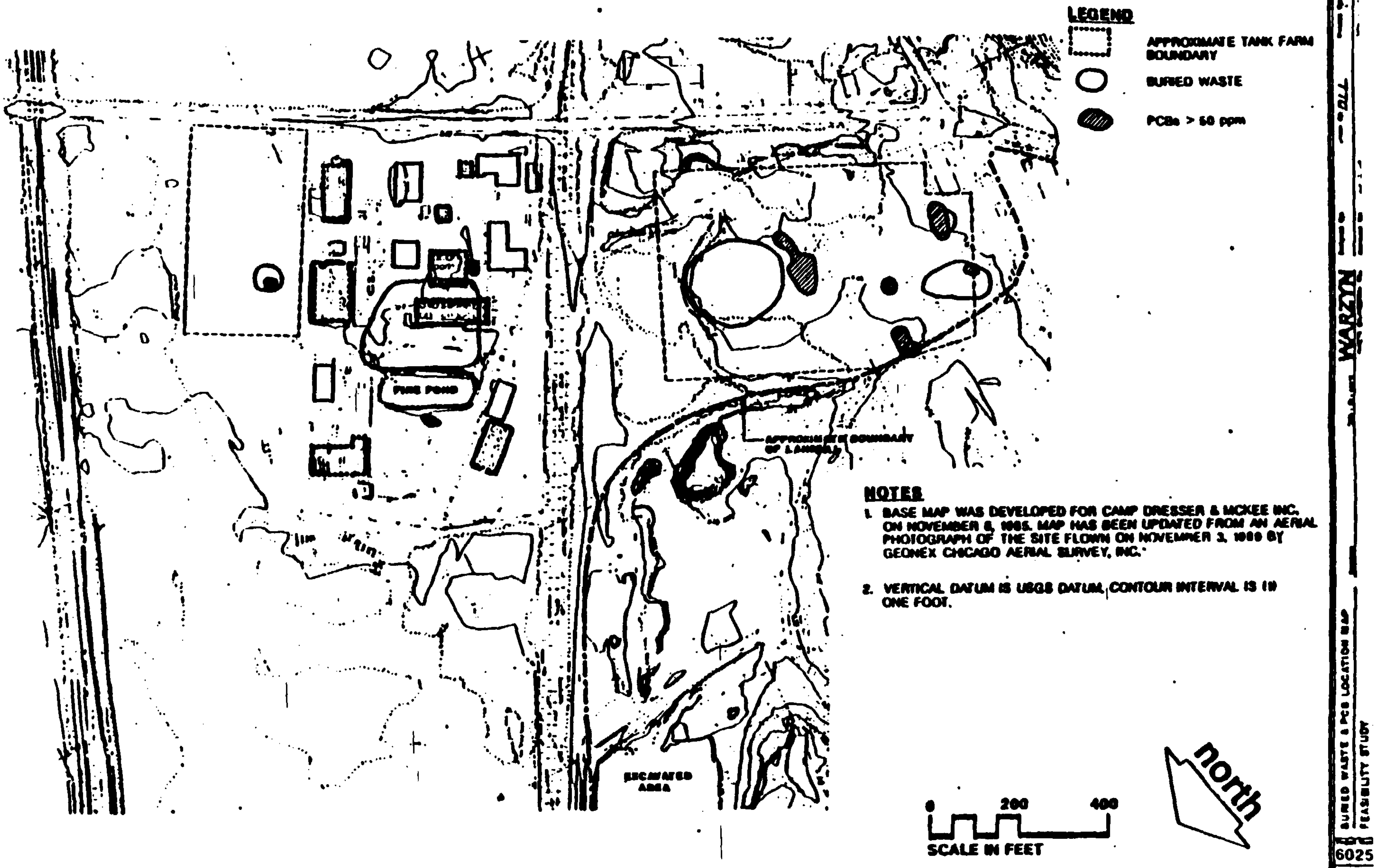

LEGEND
APPROXIMATE TANK FARM BOUNDARY
BURIED WASTE
PCBs > 50 ppm
FIRE POND
APPROXIMATE BOUNDARY OF LANDFILL
EXCAVATED AREA
NOTES
1. BASE MAP WAS DEVELOPED FOR CAMP DRESSER & MCKEE INC. ON NOVEMBER 6, 1985. MAP HAS BEEN UPDATED FROM AN AERIAL PHOTOGRAPH OF THE SITE FLOWN ON NOVEMBER 3, 1989 BY GEONEX CHICAGO AERIAL SURVEY, INC.
2. VERTICAL DATUM IS USGS DATUM, CONTOUR INTERVAL IS (1) ONE FOOT.
0
200
400
SCALE IN FEET
north
WARZYN
BURIED WASTE & PCB LOCATION MAP
FEASIBILITY STUDY
6025

FIGURE 3

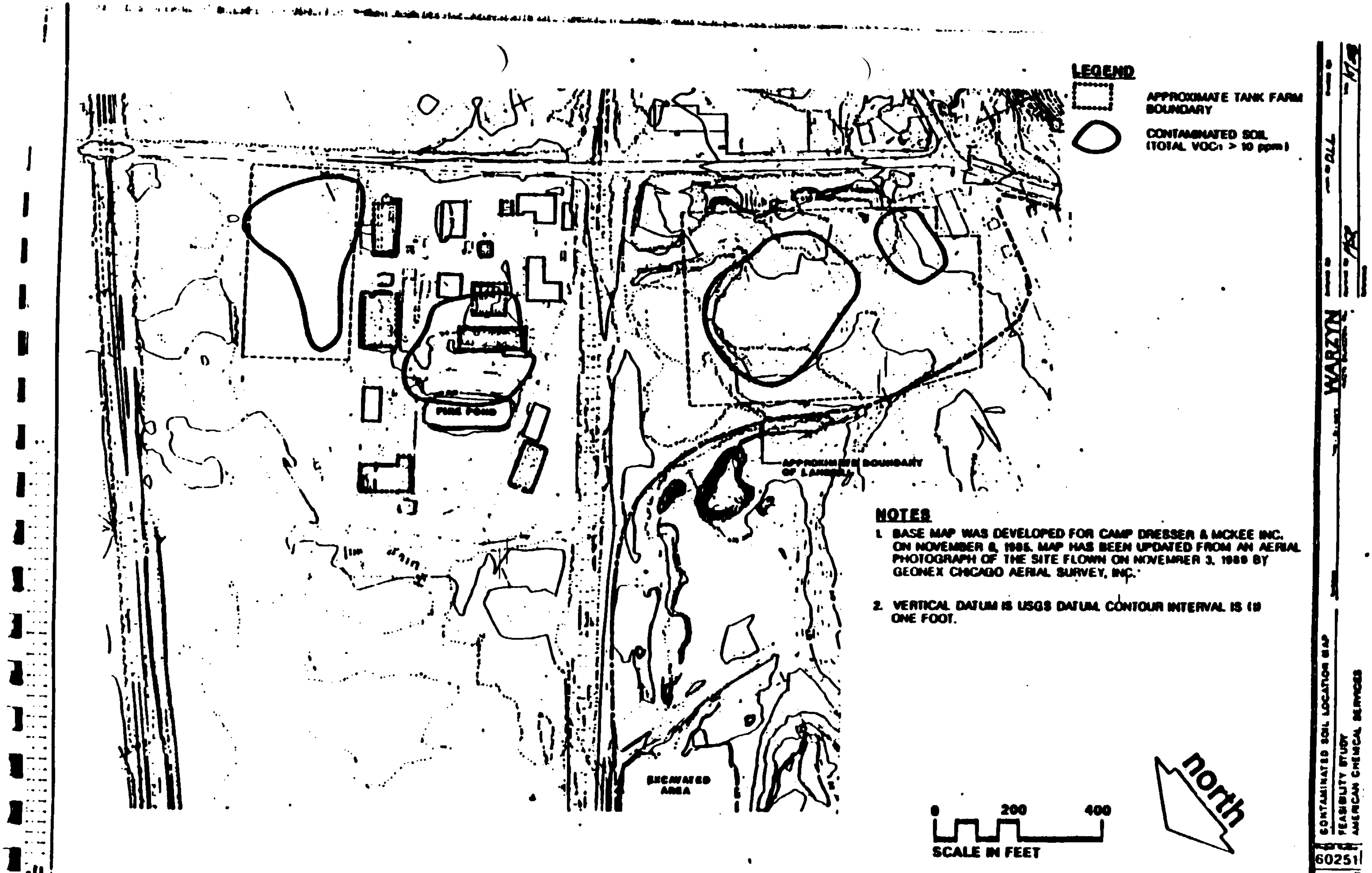
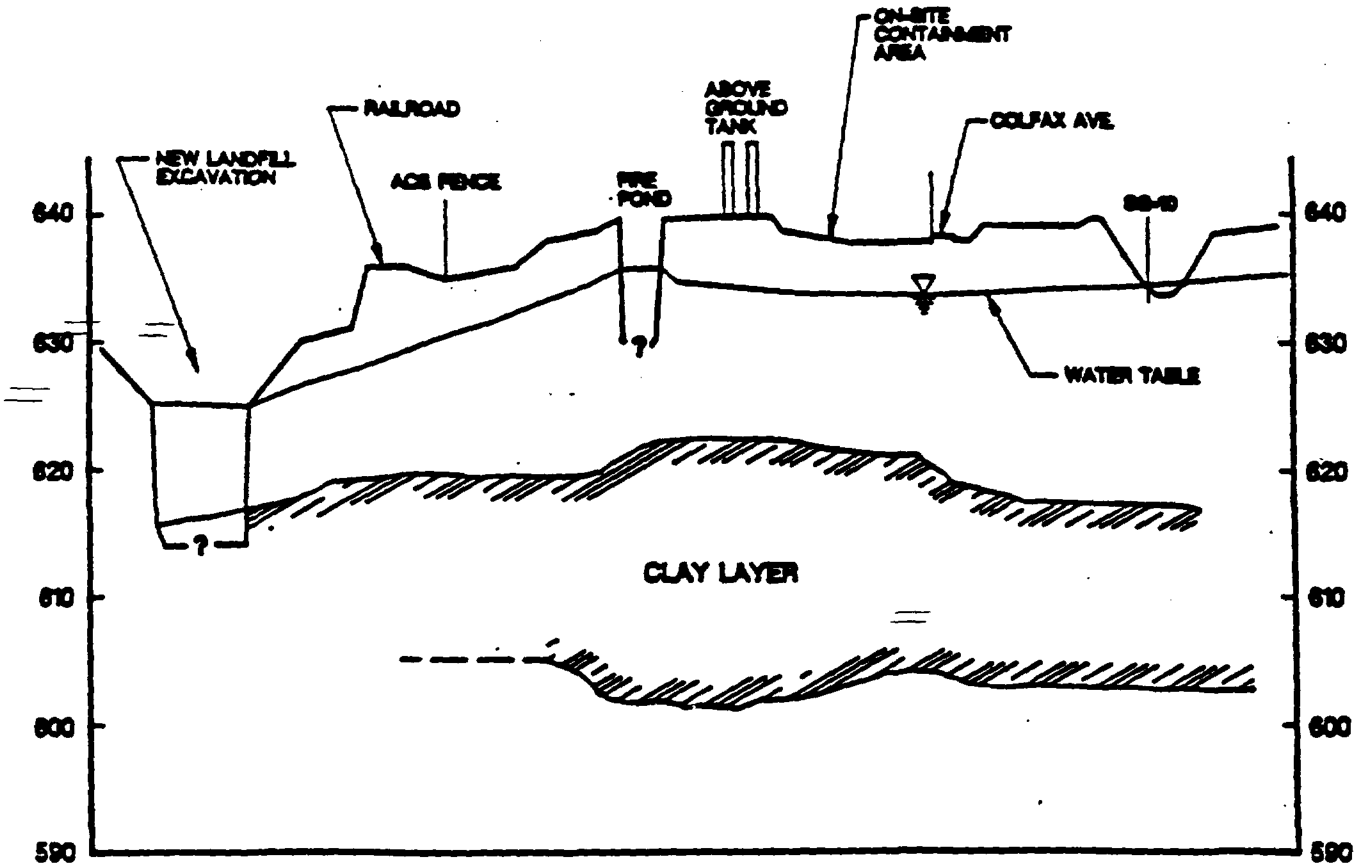
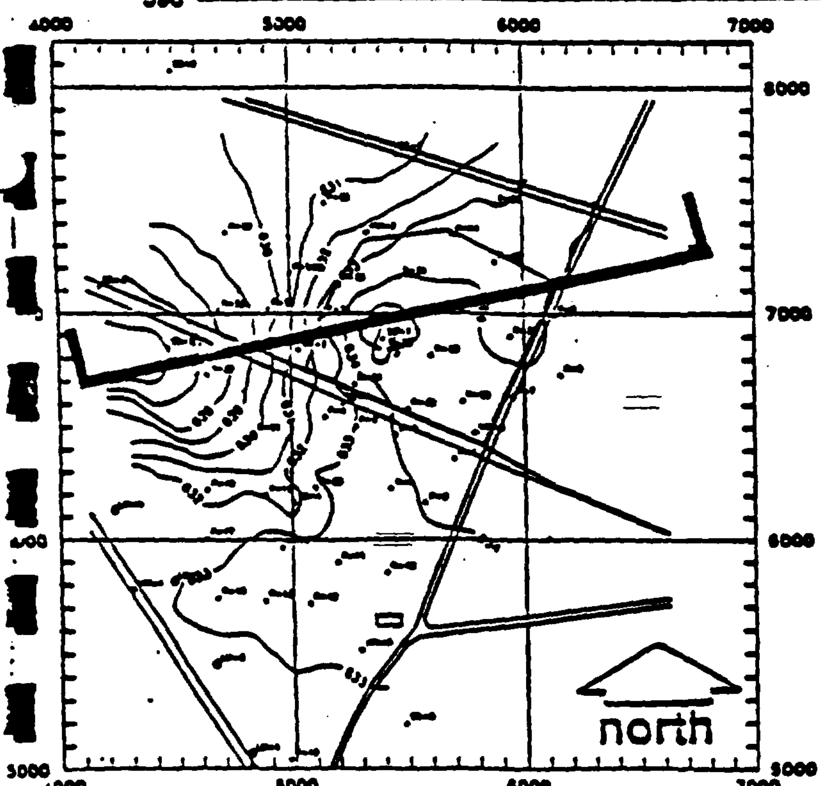

LEGEND
APPROXIMATE TANK FARM BOUNDARY
CONTAMINATED SOIL (TOTAL VOCs > 10 ppm)
FIRE POND
APPROXIMATE BOUNDARY OF LANDFILL
EXCAVATED AREA
NOTES
1. BASE MAP WAS DEVELOPED FOR CAMP DRESSER & MCKEE INC. ON NOVEMBER 6, 1985. MAP HAS BEEN UPDATED FROM AN AERIAL PHOTOGRAPH OF THE SITE FLOWN ON NOVEMBER 3, 1989 BY GEONEX CHICAGO AERIAL SURVEY, INC.
2. VERTICAL DATUM IS USGS DATUM. CONTOUR INTERVAL IS (1) ONE FOOT.
0
200
400
SCALE IN FEET
north
WARZYN
CONTAMINATED SOIL LOCATION MAP
FEASIBILITY STUDY
AMERICAN CHEMICAL SERVICES
60251

FIGURE 4



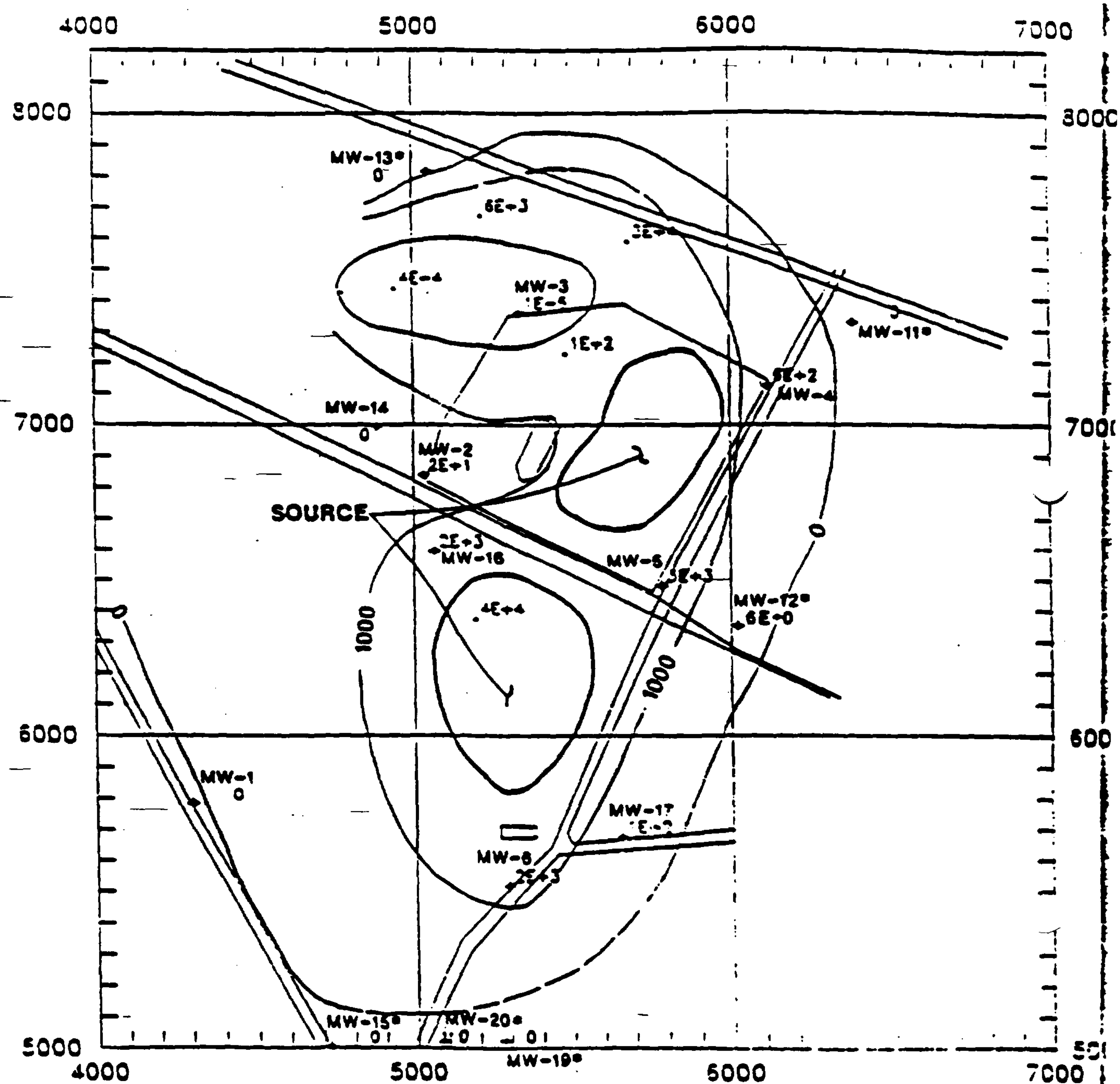


NOTES

1. DEPTH OF FIRE POND AND NEW LANDFILL EXCAVATION UNKNOWN.

FIGURE

WARZYN	SITE CROSS-SECTION ILLUSTRATING CLAY CONFINING LAYER THICKNESS	Drawn ELR,DLL,TJM,JAW	Checked JAW	App'd.
	REMEDIAL INVESTIGATION AMERICAN CHEMICAL SERVICES	Revisions		Date 9/21/86

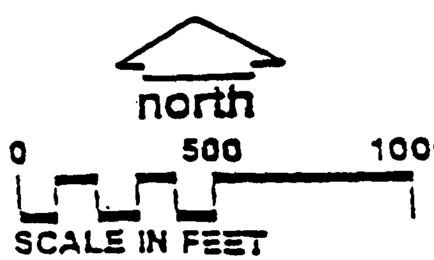


LEGEND

- UPPER AQUIFER MONITORING WELL LOCATION
- ISO-CONCENTRATION LINE
- ▲ AQUIFER MATRIX SAMPLE

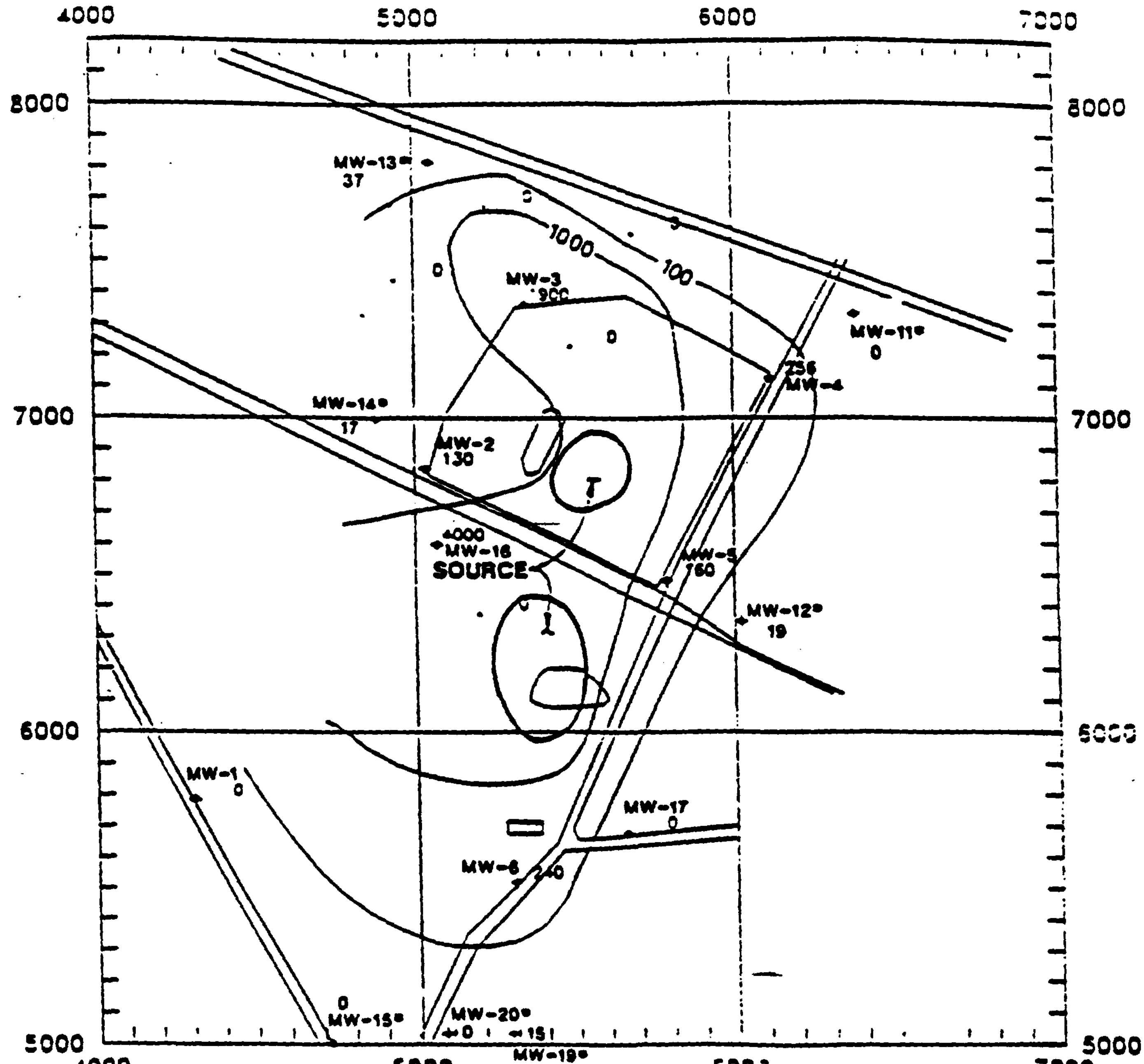
NOTES

1. * INDICATES SAMPLES COLLECTED JAN. 16, 17 OR 18, 1991. ALL OTHER SAMPLES COLLECTED DURING PHASE II OF THE INVESTIGATION.



FIGURE

WARZYN	UPPER AQUIFER BETX DISTRIBUTION (ug/l)	Drawn DLL, T.M. JAW	Checked JAW	App'd.	SR
		Revisions		Date	10/93



LEGEND

- UPPER AQUIFER MONITORING WELL LOCATION
- ISO-CONCENTRATION LINE
- ▲ AQUIFER MATRIX SAMPLE

NOTES

1. * INDICATES SAMPLES COLLECTED JAN. 16, 17 OR 18, 1991. ALL OTHER SAMPLES COLLECTED DURING PHASE II OF THE INVESTIGATION.

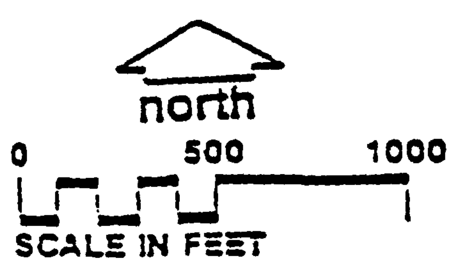
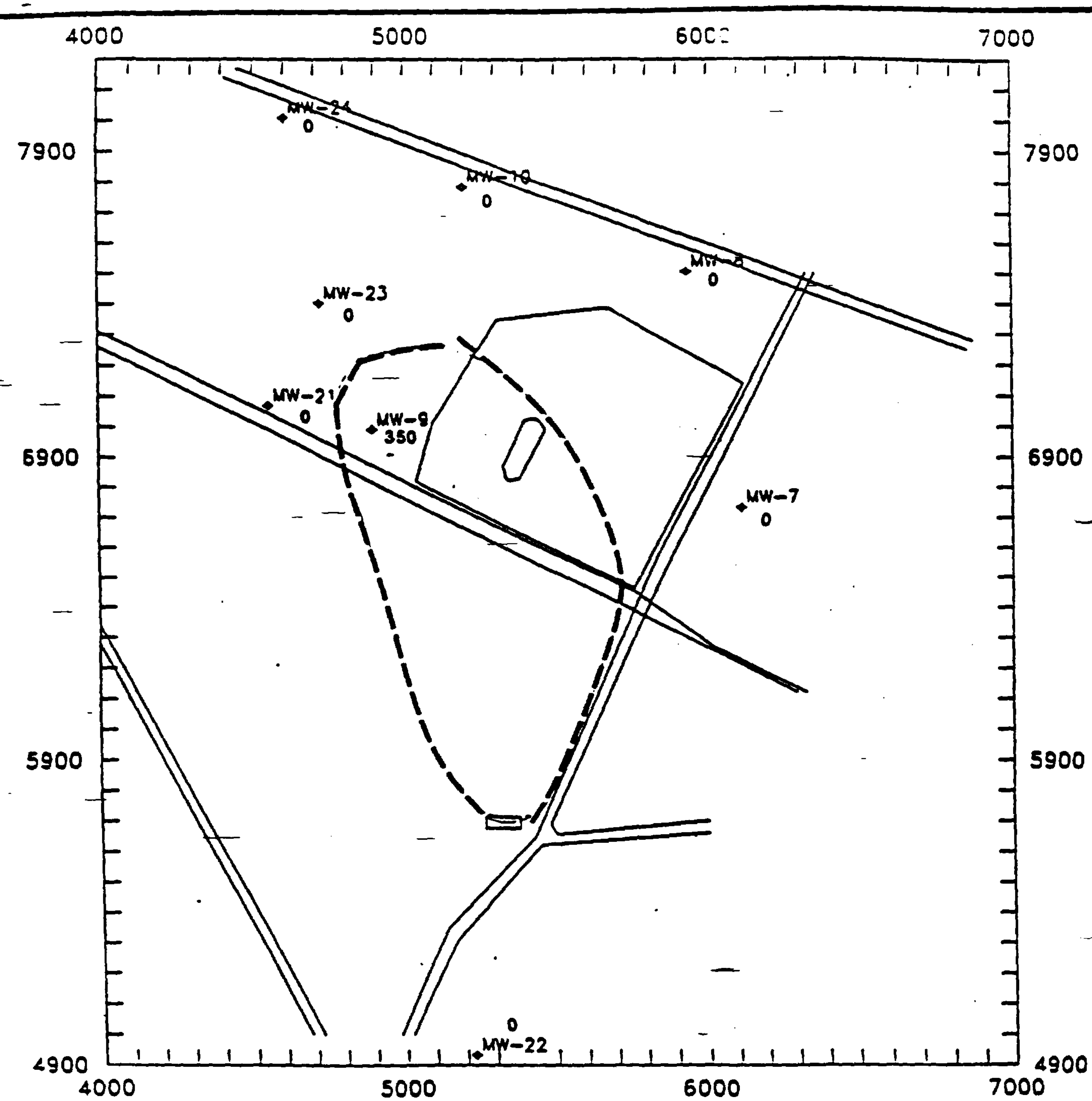


FIGURE 7

WARZYN	UPPER AQUIFER CHLORINATED ETHANE DISTRIBUTION (ug/l)	Drawn ... JAW	Checked JAW	App'd. ?/5R Date 1/...



LEGEND

◆ UPPER AQUIFER MONITORING WELL LOCATION

– – – ESTIMATED BOUNDARY OF CHLOROETHANE PRESENCE IN LOWER AQUIFER

0 CHLOROETHANE CONCENTRATION (ug/l)

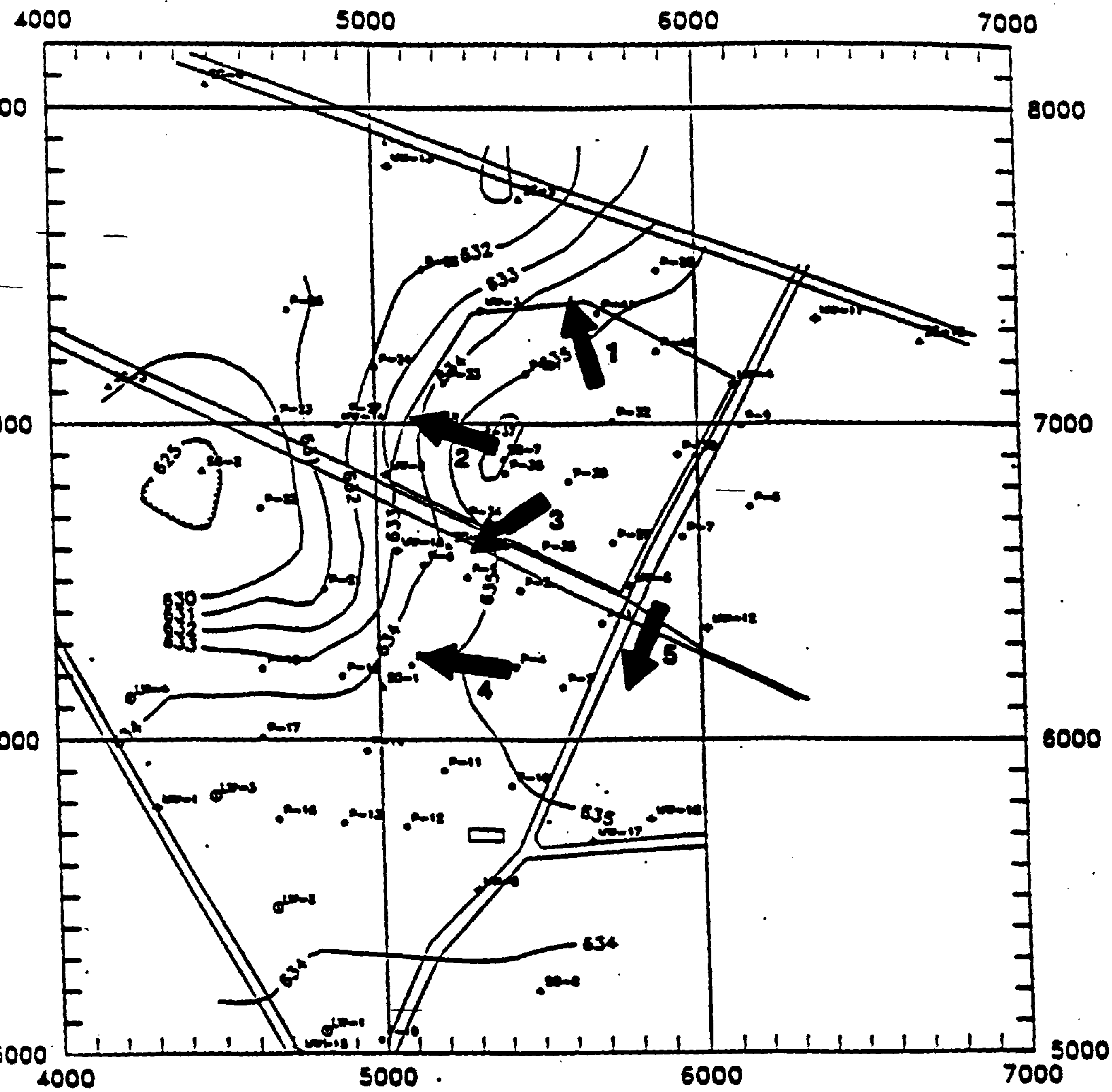
north

0 500 1000

SCALE IN FEET

FIGURE 8

WARZYN	CHLOROETHANE CONCENTRATIONS IN LOWER AQUIFER (JAN. 16, 17 & 18, 1991)	Drawn D.L.L.	Checked	App'd:



LEGEND

- UPPER AQUIFER MONITORING WELL LOCATION
- LEACHATE WELL LOCATION
- PIEZOMETER LOCATION
- STAFF GAUGE LOCATION
- 1 GROUNDWATER FLOW PATH

NOTES

1. GROUNDWATER FLOW PATHS ARE DESCRIBED IN TABLE 4-5.

north

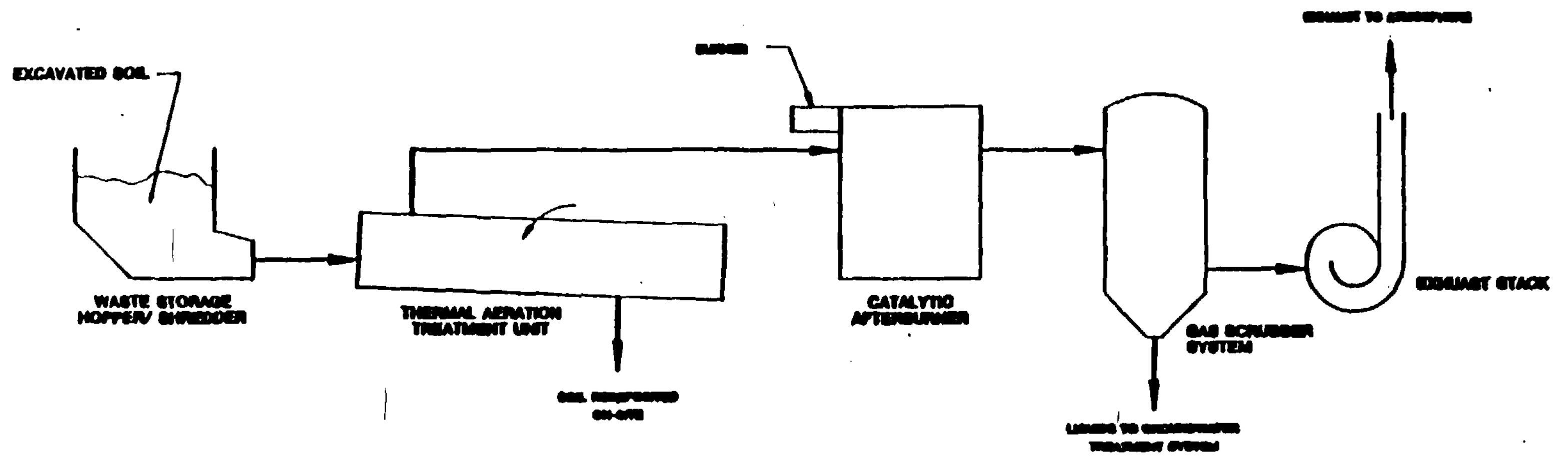
0 500 1000

SCALE IN FEET

FIGURE

UPPER AQUIFER GROUNDWATER

Drawn DLL T.J.M. JAW. Checked JAW App'd. MSR

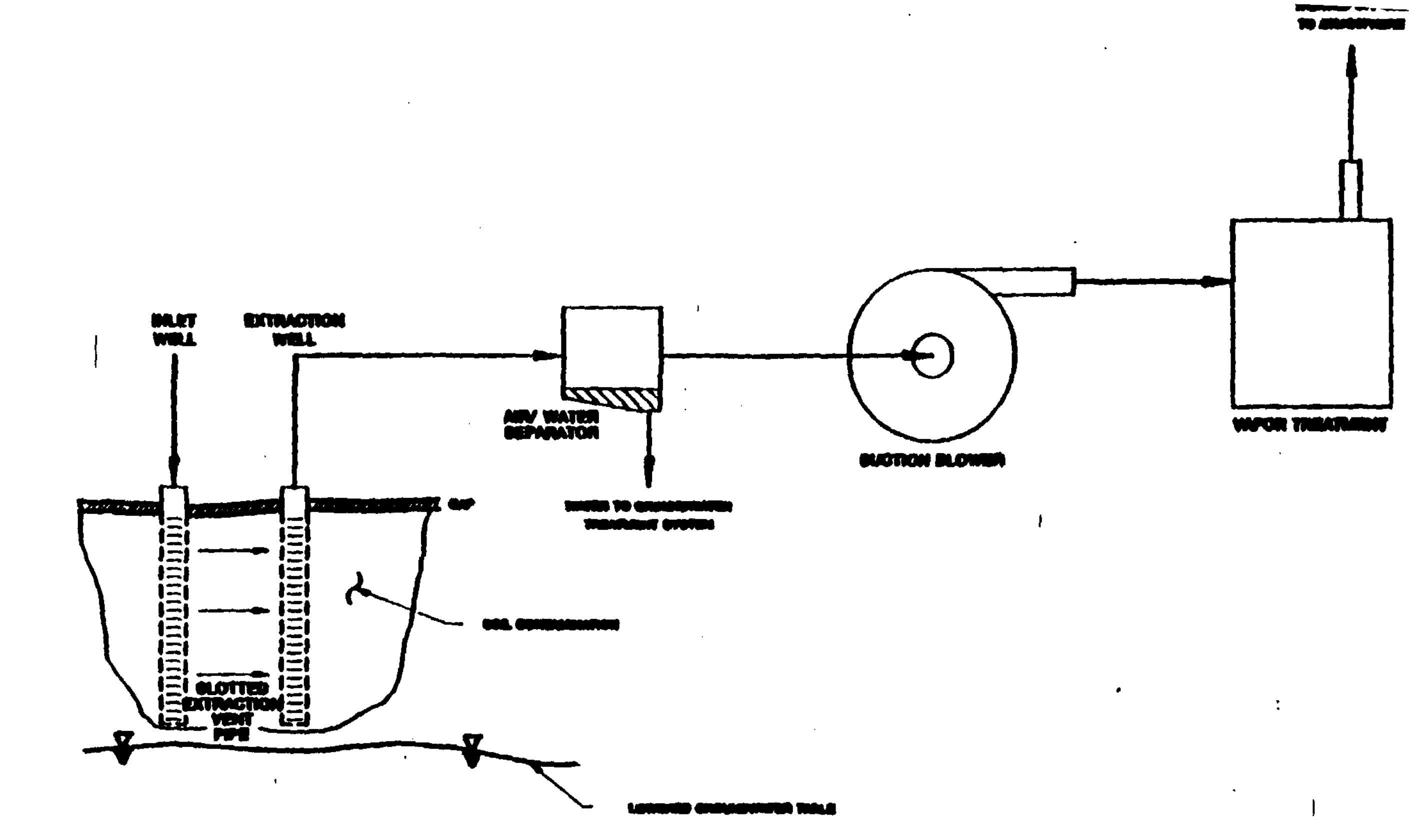


NOTES

1. THE PROCESS EQUIPMENT SHOWN WAS INCLUDED IN THE COST ESTIMATES. THE OPTIMAL TREATMENT SYSTEM CONFIGURATION WILL BE DETERMINED DURING FINAL DESIGN.
2. THERMAL TREATMENT SOIL FEED RATE IS 10 TONS PER HOUR. THE SYSTEM WOULD BE OPERATED ON A CONTINUOUS BASIS.

WARZYN

FIGURE 10



NOTES

1. THE PROCESS EQUIPMENT SHOWN WAS INCLUDED IN THE COST ESTIMATES. THE OPTIMAL TREATMENT SYSTEM CONFIGURATION WILL BE DETERMINED DURING FINAL DESIGN.
2. THE VAPOR EXTRACTION SYSTEM INCLUDES 18 EXTRACTION WELLS TOTAL. A PRELIMINARY FLOW RATE OF 60 CUBIC FEET PER MINUTE PER WELL WAS DETERMINED BASED ON GROUNDWATER PERMEABILITY DATA AND AN OPERATING VACUUM OF 6-INCHES OF MERCURY (SEE FIGURE 4-16).
3. 4 BLOWERS AT 6-INCHES OF MERCURY VACUUM WOULD BE OPERATED CONCURRENTLY (SEE FIGURE 4-15).
4. ALL ABOVEGROUND VAPOR COLLECTION PIPING WOULD BE HEAT TRACED.
5. VAPORS WOULD BE TREATED IN A CENTRALIZED THERMAL TREATMENT UNIT RATED AT 1100 CUBIC FEET PER MINUTE AND 1600-1800 °F OPERATING TEMPERATURE.

WARZYN

FIGURE

American Chemical Services
Alternatives Cost Summar'

Alternative	Capital Cost ($X10[6])	Present Worth Annual O&M ($X10[6])	Net Present Worth ($X10[6])
No Action (Alt. 1)	$0	$0	$0
Slurry Wall Site; and Groundwater Pumping and Treatment (Alt. 2)	$3.85	$8.15	$12.0
Excavation and On-Site Incineration of Buried Waste; and Groundwater Pumping and Treatment (Alt. 3a)	$38.70	$16.13	$54.8
Excavation and On-Site Low Temp Thermal Treatment of Buried Waste; and Groundwater Pumping and Treatment (Alt. 3b)	$28.95	$16.13	$45.1
In-Situ Steam Stripping of Buried Waste, Soils and Groundwater; and Groundwater Pumping and Treatment (Alt. 4)	$13.74	$37.14	$50.9
In-Situ Vapor Extraction of Buried Waste and Soils; and Groundwater Pumping and Treatment (Alt. 5)	$12.64	$20.40	$33.0
Excavation and On-Site Incineration of Buried Waste; In-Situ Vapor Extraction of Soils; and Groundwater Pumping and Treatment (Alt. 6a)	$26.89	$16.17	$43.1
Excavation and On-Site Low Temp Thermal Treatment of Buried Waste; In-Situ Vapor Extraction of Soils; and Groundwater Pumping and Treatment (Alt. 6b)	$21.64	$16.17	$37.8

Alternative	Capital Cost ($\$X10^6$)	Present Worth Annual O&M ($\$X10^6$)	Net Present Worth ($\$X10^6$)
On-Site Incineration of Buried Waste and Soils; and Groundwater Pumping and Treatment (Alt. 7a)	$70.20	$14.43	$84.6
On-Site Low Temp Thermal Treatment of Buried Waste and Soils; and Groundwater Pumping and Treatment (Alt. 7b)	$49.95	$14.43	$64.4
Excavation and Landfarming of Buried Waste and Soils; and Groundwater Pumping and Treatment (Alt. 8a)	$11.44	$22.77	$34.2
Excavation and Slurry-Phase Bioreactor Treatment of Buried Waste and Soils; and Groundwater Pumping and Treatment (Alt. 8b)	$16.63	$26.56	$43.2

Note:
1. Cost estimates for alternatives 3 thru 8 are based on a groundwater treatment capital cost of $1.2 million and first year O&M costs of $750,000. Groundwater treatment annual O&M costs were assumed to decrease with time based on decreasing influent concentrations with continuing source treatment and groundwater flushing.

Table 7-38

SUMMARY OF HAZARD INDICES AND CANCER RISKS FOR POTENTIALLY EXPOSED POPULATIONS
American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Population/Exposure Pathway	Table Number	Hazard Indices: Ingestion	Hazard Indices: Dermal Absorption	Hazard Indices: Inhalation	Cancer Risks: Ingestion	Cancer Risks: Dermal Absorption	Cancer Risks: Inhalation
CURRENT LAND USE CONDITIONS							
Off-Site Resident-Adult							
Groundwater, Lower Aquifer	7-19	8.1e-01	2.7e-02	3.5e-01	2.6e-04	1.6e-06	2.7e-05
Ambient Air, VOC	7-20	-	-	9.3e-01	-	-	1.6e-04
Ambient Air, Dust	7-21	-	-	3.4e-04	-	-	5.2e-09
Population Total			2.1e+00			4.5e-04	
Off-Site Resident-Child							
Groundwater, Upper Aquifer	7-22	3.2e+00	1.5e+02	-	2.8e-04	1.7e-02	-
Population Total			1.5e+02			1.7e-02	
Trespasser-Child							
Surface Soils, Kapica-Pazmey	7-23	3.7e-01	1.2e+01	-	9.3e-05	5.5e-03	-
Surface Water	7-24	6.4e-03	1.2e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-26	-	-	5.3e+00	-	-	2.9e-04
Ambient Air, Dust	7-27	-	-	3.9e-04	-	-	2.0e-09
Population Total			1.9e+01			6.3e-03	
ACS Worker							
Ambient Air, VOC	7-28	-	-	9.9e+00	-	-	1.6e-03
Ambient Air, Dust	7-29	-	-	7.4e-04	-		1.1e-08
Population Total			9.9e+00			1.6e-03	

Table 7-38
(Continued)

Population/Exposure Pathway	Table Number	Hazard Indices: Ingestion	Hazard Indices: Dermal Absorption	Hazard Indices: Inhalation	Cancer Risks: Ingestion	Cancer Risks: Dermal Absorption	Cancer Risks: Inhalation
FUTURE LAND USE CONDITIONS							
On-Site Resident - On-Site Containment Area							
Groundwater, Lower Aquifer	7-30	9.3e-01	3.1e-02	3.5e-01	3.5e-04	2.1e-06	3.9e-05
Groundwater, Upper Aquifer	7-31	2.0e+02	2.0e+01	1.1e+02	6.0e-02	9.7e-03	1.7e-02
Surface Water	7-24	6.4e-03	1.2e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-32	-	-	1.6e+01	-	-	2.7e-03
Soils	7-33	1.2e+00	4.9e+01	-	1.9e-04	6.6e-03	-
Population Total*			4.0e+02			9.7e-02	
On-Site Resident - Still Bottoms and Treatment Lagoons							
Groundwater, Lower Aquifer	7-30	9.3e-01	3.1e-02	3.5e-01	3.5e-04	2.1e-06	3.9e-05
Groundwater, Upper Aquifer	7-31	2.0e+02	2.0e+01	1.1e+02	6.0e-02	9.7e-03	1.7e-02
Surface Water	7-24	6.4e-03	1.2e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-32	-	-	1.6e+01	-	-	2.7e-03
Soils	7-34	8.3e+00	4.1e+02	-	8.8e-04	3.8e-02	-
Population Total*			7.7e+02			1.3e-01	
On-Site Resident - Off-Site Containment Area							
Groundwater, Lower Aquifer	7-30	9.3e-01	3.1e-02	3.5e-01	3.5e-04	2.1e-06	3.9e-05
Groundwater, Upper Aquifer	7-31	2.0e+02	2.0e+01	1.1e+02	6.0e-02	9.7e-03	1.7e-02
Surface Water	7-24	6.4e-03	1.2e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-32	-	-	1.6e+01	-	-	2.7e-03
Soils	7-35	1.8e+01	1.0e+03	-	3.3e-03	1.5e-01	-
Population Total*			1.4e+03			2.4e-01	

Table 7-38
(Continued)

Population/Exposure Pathway	Table Number	Hazard Indices: Ingestion	Hazard Indices: Dermal Absorption	Hazard Indices: Inhalation	Cancer Risks: Ingestion	Cancer Risks: Dermal Absorption	Cancer Risks: Inhalation
On-Site Resident - Surface Soils, Kapica-Pazmey							
Groundwater, Lower Aquifer	7-30	9.3e-01	3.1e-02	3.5e-01	3.5e-04	2.1e-06	3.9e-05
Groundwater, Upper Aquifer	7-31	2.0e+02	2.0e+01	1.1e+02	6.0e-02	9.7e-03	1.7e-02
Surface Water	7-24	6.4e-03	1.2e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-32	-	-	1.6e+01	-	-	2.7e-03
Soils	7-36	1.6e+00	3.3e+01	-	1.2e-03	4.4e-02	-
Population Total*			3.8e+02			1.4e-01	
On-Site Resident- Soils All depths Kapica-Pazmey							
Groundwater, Lower Aquifer	7-30	9.3e-01	3.1e-02	3.5e-01	3.5e-04	2.1e-06	3.9e-05
Groundwater, Upper Aquifer	7-31	2.0e+02	2.0e+01	1.1e+02	6.0e-02	9.7e-03	1.7e-02
Surface Water	7-24	6.4e-03	1.2e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.2e-04	
Ambient Air, VOC	7-32	-	-	1.6e+01	-	-	2.7e-03
Soils	7-37	1.6e+00	3.4e+01	-	4.1e-04	1.8e-02	-
Population Total*			3.8e+02			1.1e-01	

Table 7-38
(Continued)

Population/Exposure Pathway	Table Number	Hazard Indices: Ingestion	Hazard Indices: Dermal Absorption	Hazard Indices: Inhalation	Cancer Risks: Ingestion	Cancer Risks: Dermal Absorption	Cancer Risks: Inhalation
Multi-Population Assessment (1)							
Off-Site Resident - Adult & Off-Site Resident - Child							
Off-Site Resident Adult							
Groundwater, Lower Aquifer	7-19	8.1e-01	2.7e-02	3.5e-01	2.6e-04	1.6e-06	2.7e-05
Ambient Air, VOC	7-20	-	-	9.3e-01	-	-	1.6e-04
Ambient Air, Dust	7-21	-	-	3.4e-04	-	-	5.2e-09
Off-Site Resident-Child							
Groundwater, Upper Aquifer	7-22	3.2e+00	1.5e+02	-	2.8e-04	1.7e-02	
Population Total			1.6e+02			1.7e-02	
Off-Site Resident - Adult & Trespasser - Child (2)							
Off-Site Resident-Adult							
Groundwater, Lower Aquifer	7-19	8.1e-01	2.7e-02	3.5e-01	2.6e-04	1.6e-06	2.7e-05
Ambient Air, VOC	7-20	-	-	9.3e-01	-	-	1.6e-04
Ambient Air, Dust	7-21	-	-	3.4e-04	-	-	5.2e-09
Trespasser-Child							
Surface Soils, Kapica - Pazmey	7-23	3.7e-01	1.2e+01	-	9.3e-05	5.5e-03	-
Surface Water	7-24	6.4e-03	1.2e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-26	-	-	5.3e+00	-	-	2.9e-04
Ambient Air, Dust	7-27	-	-	3.9e-04	-	-	2.0e-09
Population Total			2.1e+01			6.7e-03	

Table 7-38
(Continued)

Population/Exposure Pathway	Table Number	Hazard Indices: Ingestion	Hazard Indices: Dermal Absorption	Hazard Indices: Inhalation	Cancer Risks: Ingestion	Cancer Risks: Dermal Absorption	Cancer Risks: Inhalation
Off-Site Resident - Adult & Off-Site Resident - Child & Trespasser - Child (2)							
Off-Site Resident Adult							
Groundwater, Lower Aquifer	7-19	8.1e-01	2.7e-02	3.5e-01	2.6e-04	1.6e-06	2.7e-05
Ambient Air, VOC	7-20	-	-	9.3e-01	-	-	1.6e-04
Ambient Air, Dust	7-21	-	-	3.4e-04	-	-	5.2e-09
Off-Site Resident-Child							
Groundwater, Upper Aquifer	7-22	3.2e+00	1.5e+02	-	2.8e-04	1.7e-02	-
Trespasser-Child							
Surface Soils, Kapica - Pazmey	7-23	3.7e-01	1.2e+01	-	9.3e-05	5.5e-03	-
Surface Water	7-24	6.4e-03	1.2e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-26	-	-	5.3e+00	-	-	2.9e-04
Ambient Air, Dust	7-27	-	-	3.9e-04	-	-	2.0e-09
Population Total			1.7e+02			2.4e-02	
Off-Site Resident - Adult & ACS Worker (3)							
Off-Site Resident-Adult							
Groundwater, Lower Aquifer	7-19	8.1e-01	2.7e-02	3.5e-01	2.6e-04	1.6e-06	2.7e-05
Ambient Air, VOC	7-20	-	-	9.3e-01	-	-	1.6e-04
Ambient Air, Dust	7-21	-	-	3.4e-04	-	-	5.2e-09
ACS Worker							
Ambient Air, VOC	7-28	-	-	9.9e+00	-	-	1.6e-03
Ambient Air, Dust	7-29	-	-	7.4e-04	-		1.1e-08
Population Total			1.2e+01			2.1e-03	

Table 7-38
(Continued)

(*) Total population hazard indices and cancer risks for future Site residents were calculated by incorporating values for groundwater in the upper aquifer.

(1) In addition to the current use exposures that exist for each population as described above, it is possible that a trespasser may also be an off-Site resident, and on-Site workers may be an off-Site resident. Thus, while pathways have been combined for each individual population, populations have also been combined, as appropriate (e.g., off-Site resident and trespasser) to evaluate the maximum exposure of a population through current land use conditions that is reasonably expected to occur at the Site.

(2) The amount of exposure time to contaminants in air as a trespasser (3 hours/day, 52 days/year, 10 years) is 1.2% of the off-Site resident (24 hours/day, 182 days/year, 30 years). Because making this adjustment does not significantly alter the total multi-population risk, individual population risks were directly added in order to evaluate maximally exposed population risks.

(3) Similarly, ACS exposure to contaminants in air while working on-Site (8 hours/day, 130 days/year, 30 years) is 23.8% of the exposure conditions assumed for the off-Site resident (24 hours/day, 182 days/year, 30 years). This difference does not have a substantial impact on the total multi-population risk. Individual population risks were directly added in order to evaluate maximally exposed population risks.